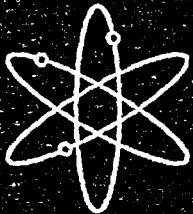




# Generic Environmental Impact Statement for License Renewal of Nuclear Plants



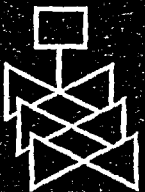
Supplement 16



Regarding  
Quad Cities Nuclear Power Station, Units 1 and 2



Final Report



U.S. Nuclear Regulatory Commission  
Office of Nuclear Reactor Regulation  
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**Generic Environmental  
Impact Statement for  
License Renewal of  
Nuclear Plants**

**Supplement 16**

**Regarding  
Quad Cities Nuclear Power Station, Units 1 and 2**

**Final Report**

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**Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001**



# Abstract

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of renewing nuclear power plant operating licenses (OLs) for a 20-year period in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, and codified the results in 10 CFR Part 51. The GEIS (and its Addendum 1) identifies 92 environmental issues and reaches generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the NRC by the Exelon Generation Company, LLC (Exelon) to renew the OLs for Quad Cities, Units 1 and 2, for an additional 20 years under 10 CFR Part 54. This SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action and responses to comments received on the SEIS.

Regarding the 69 issues for which the GEIS reached generic conclusions, neither Exelon nor the staff has identified information that is both new and significant for any issue that applies to Quad Cities. The staff determined that information provided during the scoping and SEIS comment processes did not call into question the conclusions in the GEIS. Therefore, the staff concludes that the impacts of renewing the Quad Cities OLs will not be greater than impacts identified for these issues in the GEIS. For each of these issues, the staff's conclusion in the GEIS is that the impact is of SMALL<sup>(a)</sup> significance (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, 15 apply to Quad Cities and are addressed in this SEIS. For 14 of the 15 issues, the staff concludes that the significance of the potential environmental impacts of renewal of the OLs is SMALL. The staff also concludes that for these issues, additional mitigation measures are not likely to be sufficiently beneficial as to be warranted. For the issue of electric shock from induced current along transmission line corridors, the staff concludes that the potential impact is MODERATE for one transmission line and that consideration of additional mitigation measures is warranted. In addition, the staff determined

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(a) Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

## Abstract

| that information provided during the scoping and SEIS processes did not identify any new issue  
| that requires site-specific assessment.

| The NRC staff recommends that the Commission determine that the adverse environmental  
impacts of license renewal for Quad Cities Units 1 and 2 are not so great that preserving the  
option of license renewal for energy-planning decisionmakers would be unreasonable. This  
recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental  
| Report submitted by Exelon; (3) consultation and discussions with Federal, State, and local  
agencies; (4) the staff's own independent review; and (5) the staff's consideration of the public  
| comments.

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# Executive Summary

By letter dated January 3, 2003, the Exelon Generation Company, LLC (Exelon) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for Quad Cities Units 1 and 2 for an additional 20-year period. If the OLs are renewed, State regulatory agencies and Exelon will ultimately decide whether the two units will continue to operate based on factors such as the need for power or other matters within the state's jurisdiction or the purview of the owners. If the OLs are not renewed, then the units must be shut down at or before the expiration dates of the current OLs, both of which will expire on December 14, 2012.

Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has issued regulations implementing Section 102 of NEPA in 10 CFR Part 51. Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires the preparation of an EIS or a supplement to an EIS for the renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2.<sup>(a)</sup>

Upon acceptance of the Exelon application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing in the Federal Register a notice of intent to prepare an EIS and conduct scoping. The staff visited the Quad Cities site in March 2003 and held two public scoping meetings on April 8, 2003, in Moline, Illinois. In preparing this supplemental environmental impact statement (SEIS) for Quad Cities Units 1 and 2, the staff reviewed the Exelon Environmental Report (ER) and compared it to the GEIS; consulted with other agencies; conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Operating License Renewal*, and considered the public comments received during the scoping process. The public comments received during the scoping process that were considered to be within the scope of the environmental review, and the NRC staff responses, are provided in Appendix A, Part 1, of this SEIS.

A draft SEIS was published in November 2003. In December 2003, the staff held two public meetings in Moline, Illinois, to describe the preliminary results of the NRC environmental review, answer questions, and provide members of the public with information to assist them in formulating comments on this SEIS. When the public comment period ended, the staff

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.



## Executive Summary

- | considered and dispositioned all of the comments received. These comments are addressed in Appendix A, Part II of this SEIS.
- | This SEIS includes the NRC staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The Commission has adopted the following statement of purpose and need for license renewal from the GEIS:

- | The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than the NRC) decisionmakers.
- | The evaluation criterion for the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine
  - ... whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

NRC regulations [10 CFR 51.95(c)(2)] contain the following statement regarding the content of SEISs prepared at the license renewal stage:

The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operation—generic determination of no significant environmental impact"] and in accordance with § 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines. The following definitions of the three significance levels are set forth in footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

**SMALL** – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

**MODERATE** – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

**LARGE** – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS led to the following conclusions:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 Issues. In the absence of new and significant information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated as Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

## Executive Summary

This SEIS documents the staff's evaluation of all 92 environmental issues considered in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the OLS for Quad Cities Units 1 and 2) and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's Energy Information Administration, gas- and coal-fired generation appear to be the most likely power-generation alternatives if the power from Units 1 and 2 is replaced. These alternatives are evaluated in detail, assuming that the replacement power generation plant is located at either the Quad Cities site or an unspecified alternate location.

Exelon and the staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Exelon nor the staff has identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither Exelon, the scoping process, nor the staff have identified any new issue applicable to Quad Cities Units 1 and 2 that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all of the Category 1 issues that are applicable to Quad Cities Units 1 and 2.

Exelon's license renewal application presents an analysis of the Category 2 issues that are applicable to Quad Cities Units 1 and 2 plus environmental justice. The staff has reviewed the Exelon analysis for each issue and has conducted an independent review of each issue. Four Category 2 issues are not applicable, because they are related to plant design features or site characteristics not found at Quad Cities. Four Category 2 issues are not discussed in this SEIS, because they are specifically related to refurbishment. Exelon has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of Quad Cities Units 1 and 2 for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement, and therefore, are not expected to affect the environment outside the bounds of plant operations evaluated in the U.S. Atomic Energy Commission's 1972 *Final Environmental Statement Related to the Operation of Quad Cities Nuclear Station Units 1 & 2*.

Thirteen Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as the remaining two issues, environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. For 12 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that appropriate Federal health agencies have not reached a consensus on the

existence of chronic, adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for Quad Cities Units 1 and 2 and the plant improvements already made, the staff concludes that four of the candidate SAMAs are cost-beneficial and two other SAMAs are potentially cost-beneficial. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they do not need to be implemented as part of license renewal pursuant to 10 CFR Part 54.

For one issue, the staff's conclusion is that the potential environmental impact of renewal term operations of Quad Cities Units 1 and 2 is greater than SMALL. The staff concludes that the impact of the potential for electric shock from induced current along transmission line corridors is MODERATE on the portion of the north Nelson line where the calculated induced current exceeds the 5 mA criterion specified in the National Electric Safety Code. Exelon's ER reported a calculated value of 6 mA.

Mitigation measures were considered for each Category 2 issue. Existing measures to mitigate the environmental impacts of plant operation were found to be adequate for 12 issues, and no additional mitigation measures were deemed sufficiently beneficial for these issues to be warranted. However, for the issue of the potential for electric shock along transmission line corridors from transmission line induced current, consideration of further mitigation is warranted. The NRC staff findings related to this issue have been provided to the transmission line owner.

If the Quad Cities OLs are not renewed and the units cease operation on or before the expiration of their current OLs, the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of Quad Cities Units 1 and 2. The impacts may, in fact, be greater in some areas.

The recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for Quad Cities Units 1 and 2 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by Exelon; (3) consultation with other Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of the public comments.

## Abbreviations/Acronyms

°	degree
μ	micro
μCi	microcurie(s)
μCi/mL	microcurie(s) per milliliter
μGy	microgray(s)
μm	micrometer(s)
μSv	microsievert(s)
A/C	air conditioner
AC	alternating current
ac	acres
ACC	averted cleanup and decontamination costs
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act of 1954
AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
AOC	averted offsite property damage costs
AOE	averted occupational exposure costs
AOSC	averted onsite costs
APE	averted public exposure costs
AQCR	air quality control region
ATWS	anticipated transients without scram
BMP	best management practice(s)
BOD	biological oxygen demand
Bq	becquerel(s)
Bq/mL	becquerel(s) per milliliter
Btu	British thermal unit(s)
Btu/ft <sup>3</sup>	British thermal unit(s) per cubic foot
Btu/kWh	British thermal unit(s) per kilowatt hour
BWR	boiling water reactor
BWROG	boiling water reactor owner's group
C	Celsius
CAA	Clean Air Act
CDF	core damage frequency
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second

## Abbreviations/Acronyms

Ci	curie(s)
cm	centimeter(s)
cm/s	centimeter(s) per second
COE	cost of enhancement
CWA	Clean Water Act of 1972
DBA	design-basis accident
DC	direct current
DDT	dichloro-diphenyl-trichloroethane
DOE	U.S. Department of Energy
DMR	discharge monitoring report
DSAR	draft safety analysis report
DSM	demand-side management
EIA	Energy Information Administration (of DOE)
EIS	environmental impact statement
ELF-EMF	extremely low frequency-electromagnetic field
EPA	U.S. Environmental Protection Agency
EPU	extended power uprate
EPRI	Electric Power Research Institute
ER	Environmental Report
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
ESRP	Environmental Standard Review Plan
F	Fahrenheit
FAA	U.S. Federal Aviation Administration
FES	final environmental statement
FIVE	fire-induced vulnerability evaluation
FPS	fire-protection system
FR	<i>Federal Register</i>
FSAR	final safety analysis report
ft	foot (feet)
ft/s	foot (feet) per second
ft <sup>3</sup>	cubic foot (feet)
ft <sup>3</sup> /s	cubic foot (feet) per second
ft <sup>3</sup> /yr	cubic foot (feet) per year
F-V	Fussel-Veseley
FWS	U.S. Fish and Wildlife Service
g	unit measure of ground acceleration
gal	gallon(s)

## Abbreviations/Acronyms

gal/s	gallon(s) per second
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
GIS	geographic information systems
gpd	gallon(s) per day
gpm	gallon(s) per minute
Gy	gray(s)
ha	hectare(s)
HCLPF	high confidence low probability of failure
HEPA	high-efficiency particulate air (filter)
HLW	high-level waste
hr	hour(s)
Hz	Hertz
IA DNR	Iowa Department of Natural Resources
IEMA	Illinois Emergency Management Agency
IEPA	Illinois Environmental Protection Agency
IL DNR	Illinois Department of Natural Resources
INEEL	Idaho National Engineering and Environmental Laboratory
in.	inch(es)
IPA	integrated plant assessment
IPE	individual plant examination
IPEEE	individual plant examination of external events
IRS	Illinois Revised Statutes
ISFSI	independent spent fuel storage installation
ISLOCA	interfacing systems loss of coolant accident
J	joule(s)
km	kilometer(s)
km <sup>2</sup>	square kilometer(s)
kV	kilovolt(s)
kW	kilowatt(s)
kWh	kilowatt hour(s)
kWh/m <sup>2</sup>	kilowatt hour(s) per square meter
L	liter(s)
L/d	liter(s) per day
L/min	liter(s) per minute
L/s	liter(s) per second
lb	pound(s)

## Abbreviations/Acronyms

lb/MWh	pound(s) per megawatt hour
LERF	large early release frequency
LLC	Limited Liability Corporation
LMS	Lawler, Matusky & Skelly Engineers
LOCA	loss of coolant accident
LOOP	loss of offsite power
LOS	level of service
LR	license renewal
m	meter(s)
m/s	meter(s) per second
m <sup>3</sup>	cubic meter(s)
m <sup>3</sup> /d	cubic meter(s) per day
m <sup>3</sup> /s	cubic meter(s) per second
m <sup>3</sup> /yr	cubic meter(s) per year
mA	milliampere(s)
MAB	maximum attainable benefit
MACCS2	MELCOR Accident Consequence Code System 2
Mbq	megabecquerel(s)
Mbq/L	megabecquerel(s) per liter
mGy	milligray(s)
mi	mile(s)
mi <sup>2</sup>	square mile(s)
mL	milliliter(s)
mm	millimeter(s)
mph	mile(s) per hour
mrad	millirad(s)
mrem	millirem(s)
mrem/yr	millirem(s) per year
MSA	Metropolitan Statistical Area
MSIV	main steam isolation valve
mSv	millisievert(s)
mSv/yr	millisievert(s) per year
MT	metric ton(s) (or tonne[s])
MT/yr	metric ton(s) (or tonne[s]) per year
MTU	metric ton(s) (or tonne[s])-uranium
MW	megawatt(s)
MWd/MTU	megawatt-day(s) per metric ton (or tonne) of uranium
MW(e)	megawatt(s) electric
MWh	megawatt hour(s)
MW(t)	megawatt(s) thermal



## Abbreviations/Acronyms

NA	not applicable
NAS	National Academy of Sciences
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NESC	National Electric Safety Code
ng	nanogram(s)
ng/J	nanogram(s) per joule
NHPA	National Historic Preservation Act of 1966
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO <sub>x</sub>	nitrogen oxide(s)
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NWFR	National Wildlife and Fish Refuge
NWPPC	Northwest Power Planning Council
ODCM	<i>Offsite Dose Calculation Manual</i>
OL	operating license
PBq	petabecquerel(s)
PCB	polychlorinated biphenyl
pCi	picocurie(s)
pCi/L	picocurie(s) per liter
PDS	plant damage state
PLEX	plant life extension
PM <sub>10</sub>	particulate matter, 10 micrometers or less in diameter
PRA	probabilistic risk assessment
PSD	prevention of significant deterioration
PV	photovoltaic
RAI	<i>request for additional information</i>
rem	special unit of dose equivalent, equal to 0.01 sievert
REMP	radiological environmental monitoring program
RFP	reactor feed pump
RHR	residual heat removal
RM	river mile(s)
ROW	right of way
RPC	replacement power costs
RRW	risk reduction worth
RWPB	radioactive-waste-processing building

## Abbreviations/Acronyms

s	second(s)
SAMA	severe accident mitigation alternative
SAR	safety analysis report
SBO	station blackout
SEIS	supplemental environmental impact statement
SER	safety evaluation report
SHPO	State Historic Preservation Office
SIP	state implementation plan
SIRWT	safety injection refueling water storage tank
SO <sub>2</sub>	sulfur dioxide
SO <sub>x</sub>	sulfur oxide(s)
SSC	structures, systems, and components
Sv	sievert(s), special unit of dose equivalent
TBq	terabecquerel(s)
TEDE	total effective dose equivalent
TLD	thermoluminescent dosimeter
UFSAR	updated final safety analysis report
UMRCC	Upper Mississippi River Conservation Committee
U.S.	United States
USACE	U.S. Army Corps of Engineers
USBC	U.S. Bureau of the Census
USC	United States Code
USDA	U.S. Department of Agriculture
USDI	U.S. Department of Interior
USGS	U.S. Geological Survey
V	volt(s)
VOC	volatile organic compound
yr	year(s)

# 1.0 Introduction

Under the U.S. Nuclear Regulatory Commission's (NRC's) environmental protection regulations in Title 10 of the Code of Federal Regulations (CFR) Part 51, which implement the National Environmental Policy Act of 1969 (NEPA), renewal of a nuclear power plant operating license (OL) requires the preparation of an environmental impact statement (EIS). In preparing the EIS, the NRC staff is required first to issue the statement in draft form for public comment and then issue a final statement after considering public comments on the draft. To support the preparation of the EIS, the staff has prepared a *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup> The GEIS is intended to (1) provide an understanding of the types and severity of environmental impacts that may occur as a result of license renewal of nuclear power plants under 10 CFR Part 54, (2) identify and assess the impacts expected to be generic to license renewal, and (3) support 10 CFR Part 51 to define the number and scope of issues that need to be addressed by the applicants in plant-by-plant renewal proceedings. Use of the GEIS guides the preparation of complete plant-specific information in support of the OL renewal process.

Exelon Generation Company, LLC (Exelon) operates Quad Cities Units 1 and 2 in Illinois under OLs DPR-29 and DPR-30, which were issued by the NRC. These OLs will both expire on December 14, 2012. On January 3, 2003, Exelon submitted an application to the NRC for renewal of the Quad Cities Units 1 and 2 OLs for an additional 20 years under the procedures in 10 CFR Part 54 (Exelon 2003a). Exelon is a *licensee* for the purposes of its current OLs and an *applicant* for the renewal of the OLs. Pursuant to 10 CFR 54.23 and 51.53(c), Exelon submitted an Environmental Report (ER) in which Exelon analyzed the environmental impacts associated with the proposed license renewal action, considered alternatives to the proposed action, and evaluated mitigation measures for reducing adverse environmental effects (Exelon 2003b).

This report is the plant-specific supplement to the GEIS (the supplemental EIS [SEIS]) for the Exelon license renewal application. This SEIS is a supplement to the GEIS because it relies, in part, on the findings of the GEIS. The staff will also prepare a separate safety evaluation report in accordance with 10 CFR Part 54.

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

## 1.1 Report Contents

The following sections of this introduction (1) describe the background for the preparation of this SEIS, including the development of the GEIS and the process used by the staff to assess the environmental impacts associated with license renewal; (2) describe the proposed Federal action to renew the Quad Cities Units 1 and 2 OLS; (3) discuss the purpose and need for the proposed action; and (4) present the status of Exelon's compliance with environmental quality standards and requirements that have been imposed by Federal, State, regional, and local agencies that are responsible for environmental protection.

- | The ensuing chapters of this SEIS closely parallel the contents and organization of the GEIS. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. Chapters 3 and 4, respectively, discuss the potential environmental impacts of plant refurbishment and plant operation during the renewal term. Chapter 5 contains an evaluation of potential environmental impacts of plant accidents and includes a consideration of severe accident mitigation alternatives (SAMAs). Chapter 6 discusses the uranium fuel cycle and solid-waste management. Chapter 7 discusses decommissioning, and Chapter 8 discusses alternatives to license renewal. Finally, Chapter 9 summarizes the findings of the preceding chapters and draws conclusions about the adverse impacts that cannot be avoided; the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and the irreversible or irretrievable commitment of resources. Chapter 9 also presents the staff's recommendation with respect to the proposed license renewal action.

Additional information is included in appendices. Appendix A contains public comments received on the environmental review for license renewal and staff responses. Appendices B through G, respectively, list the following:

- the preparers of the supplement
- | • the chronology of the NRC correspondence regarding this SEIS
- | • the organizations contacted during the development of this SEIS
- Exelon's permit compliance status (Table E-1) and copies of consultation correspondence prepared and sent during the evaluation process
- GEIS environmental issues that are not applicable to Quad Cities Units 1 and 2
- severe accident mitigation alternatives.

## 1.2 Background

Use of the GEIS, which examines the possible environmental impacts that could occur as a result of renewing individual nuclear power plant OLS under 10 CFR Part 54, and the established license renewal evaluation process support the thorough evaluation of the impacts of the renewal of OLS.

### 1.2.1 Generic Environmental Impact Statement

The NRC initiated a generic assessment of the environmental impacts associated with the license renewal term to improve the efficiency of the license renewal process by documenting the assessment results and codifying the results in the Commission's regulations. This assessment is provided in the GEIS, which serves as the principal reference for all nuclear power plant license renewal EISs.

The GEIS documents the results of the systematic approach taken to evaluate the environmental consequences of renewing the licenses of individual nuclear power plants and operating them for an additional 20 years. For each potential environmental issue, the GEIS (1) describes the activity that affects the environment, (2) identifies the population or resource that is affected, (3) assesses the nature and magnitude of the impact on the affected population or resource, (4) characterizes the significance of the effect for both beneficial and adverse effects, (5) determines whether the results of the analysis apply to all plants, and (6) considers whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants.

The NRC's standard of significance was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27, which requires consideration of both "context" and "intensity"). Using the CEQ terminology, the NRC established three significance levels—SMALL, MODERATE, or LARGE. The definitions of the three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, as follows:

**SMALL** – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

**MODERATE** – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

**LARGE** – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

## Introduction

The GEIS assigns a significance level to each environmental issue, assuming that ongoing mitigation measures would continue.

The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, **Category 1** issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely to not be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this SEIS unless new and significant information is identified.

**Category 2** issues are those that do not meet one or more of the criteria of Category 1, and therefore, additional plant-specific review for these issues is required.

In the GEIS, the staff assessed 92 environmental issues and determined that 69 qualified as Category 1 issues, 21 qualified as Category 2 issues, and 2 issues were not categorized. The latter 2 issues, environmental justice and chronic effects of electromagnetic fields, are to be addressed in a plant-specific analysis. Of the 92 issues, 11 are related only to refurbishment, 6 are related only to decommissioning, 67 apply only to operation during the renewal term, and 8 apply to both refurbishment and operation during the renewal term. A summary of the findings for all 92 issues in the GEIS is codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

### 1.2.2 License Renewal Evaluation Process

An applicant seeking to renew its OLS is required to submit an ER as part of its application (10 CFR 54.23). The license renewal evaluation process involves a careful review of the applicant's ER and assurance that all new and potentially significant information not already

addressed in or available during the GEIS evaluation is identified, reviewed, and assessed to verify the environmental impacts of the proposed license renewal.

In accordance with 10 CFR 51.53(c)(2) and (3), the ER submitted by the applicant must

- provide an analysis of the Category 2 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B in accordance with 10 CFR 51.53(c)(3)(ii)
- discuss actions to mitigate any adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action.

In accordance with 10 CFR 51.53(c)(2), the ER does not need to

- consider the economic benefits and costs of the proposed action and alternatives to the proposed action except insofar as such benefits and costs are either (1) essential for making a determination regarding the inclusion of an alternative in the range of alternatives considered or (2) relevant to mitigation
- consider the need for power and other issues not related to the environmental effects of the proposed action and the alternatives
- discuss any aspect of the storage of spent fuel within the scope of the generic determination in 10 CFR 51.23(a) in accordance with 10 CFR 51.23(b)
- contain an analysis of any Category 1 issue unless there is significant new information on a specific issue—this is pursuant to 10 CFR 51.23(c)(3)(iii) and (iv).

New and significant information is (1) information that identifies a significant environmental issue not covered in the GEIS and codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, or (2) information that was not considered in the analyses summarized in the GEIS and that leads to an impact finding that is different from the finding presented in the GEIS and codified in 10 CFR Part 51.

In preparing to submit its application to renew the Quad Cities Units 1 and 2 OLS, Exelon developed a process to ensure that information not addressed in or available during the GEIS evaluation regarding the environmental impacts of license renewal for Quad Cities Units 1 and 2 would be properly reviewed before submitting the ER and to ensure that such new and potentially significant information related to the renewal of the licenses would be identified, reviewed, and assessed during the period of the NRC review. Exelon reviewed the Category 1 issues that appear in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, to verify that the conclusions of the GEIS remained valid with respect to Quad Cities Units 1 and 2. This review

## Introduction

was performed by personnel from Exelon and its support organization who were familiar with NEPA issues and the scientific disciplines involved in the preparation of a license renewal ER.

The NRC staff also has a process for identifying new and significant information. That process is described in detail in *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal (ESRP)*, NUREG-1555, Supplement 1 (NRC 2000). The search for new information includes (1) review of an applicant's ER and the process for discovering and evaluating the significance of new information; (2) review of records of public comments; (3) review of environmental quality standards and regulations; (4) coordination with Federal, State, and local environmental protection and resource agencies; and (5) review of the technical literature. New information discovered by the staff is evaluated for significance using the criteria set forth in the GEIS. For Category 1 issues where new and significant information is identified, reconsideration of the conclusions for those issues is limited in scope to the assessment of the relevant new and significant information; the scope of the assessment does not include other facets of the issue that are not affected by the new information.

Chapters 3 through 7 discuss the environmental issues considered in the GEIS that are applicable to Quad Cities Units 1 and 2. At the beginning of the discussion of each set of issues, there is a table that identifies the issues to be addressed and lists the sections in the GEIS where the issue is discussed. Category 1 and Category 2 issues are listed in separate tables. For Category 1 issues for which there is no new and significant information, the table is followed by a set of short paragraphs that state the GEIS conclusion codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, followed by the staff's analysis and conclusion. For Category 2 issues, in addition to the list of GEIS sections where the issue is discussed, the tables list the subparagraph of 10 CFR 51.53(c)(3)(ii) that describes the analysis required and the SEIS sections where the analysis is presented. The SEIS sections that discuss the Category 2 issues are presented immediately following the table.

The NRC prepares an independent analysis of the environmental impacts of license renewal and compares these impacts with the environmental impacts of alternatives. The evaluation of the Exelon license renewal application began with publication of a notice of acceptance in the *Federal Register* (68 FR 10273 [NRC 2003a]) on March 4, 2003. The staff published a notice of intent to prepare an EIS and conduct scoping (68 FR 12385 [NRC 2003b]) on March 14, 2003. Two public scoping meetings were held on April 8, 2003, in Moline, Illinois. Comments received during the scoping period were summarized in the *Environmental Impact Statement Scoping Process: Summary Report — Quad Cities Units 1 and 2, Illinois* (NRC 2003c) dated June 16, 2003. Comments applicable to this environmental review are presented in Part 1 of Appendix A.



The staff followed the review guidance contained in the ESRP. The staff and its contractors retained to assist the staff visited the Quad Cities site on March 12, 2003, to gather information and to become familiar with the site and its environs. The staff also reviewed the comments received during scoping and consulted with Federal, State, regional, and local agencies. A list of the organizations consulted is provided in Appendix D. Other documents related to Quad Cities were reviewed and are referenced in this report.

On November 13, 2003, The NRC published the Notice of Availability of the draft SEIS in 68 FR 64372 (NRC 2003d). A 75-day comment period began on the date of the publication of the U.S. Environmental Protection Agency Notice of Filing of the draft SEIS to allow members of the public to comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings were held in Moline, Illinois, on December 16, 2003. During these meetings, the staff described the preliminary results of the NRC environmental review and answered questions to provide members of the public with information to assist them in formulating their comments. The comment period for the Quad Cities draft SEIS ended on January 27, 2004. Comments made during the 75-day comment period, including those made at the two public meetings, are presented in Part II of Appendix A of this SEIS. The NRC responses to those comments are also provided.

This SEIS presents the staff's analysis that considers and weighs the environmental effects of the proposed renewal of the Quad Cities OLs, the environmental impacts of alternatives to license renewal, and mitigation measures available for avoiding adverse environmental effects. Chapter 9, "Summary and Conclusions," provides the NRC staff's recommendation to the Commission on whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable.

### **1.3 The Proposed Federal Action**

The proposed Federal action is renewal of the OLs for Quad Cities Units 1 and 2. The Quad Cities nuclear plant is located on the bank of the Mississippi River in Rock Island County, Illinois. The Quad Cities (Moline/East Moline, Rock Island, Davenport, and Bettendorf) are the largest cities within 80 km (50 mi) of Quad Cities Units 1 and 2.

The current OLs for Unit 1 and Unit 2 expire on December 14, 2012. By letter dated January 3, 2003, Exelon submitted an application to the NRC (Exelon 2003a) to renew these OLs for an additional 20 years of operation (i.e., until December 14, 2032).

The plant has two boiling water reactors designed by General Electric Company. Each reactor has a design rating for a net electrical-power output of 930 megawatts electric [MW(e)]. Once-through cooling water from the Mississippi River is used to remove heat from the main (turbine)

condensers via the circulating-water system and from other auxiliary equipment via the service water system. Quad Cities produces enough electricity to supply the needs of 350,000 industrial users, commercial establishments, and residences.

## **1.4 The Purpose and Need for the Proposed Action**

Although a licensee must have a renewed license to operate a reactor beyond the term of the existing OL, the possession of that license is just one of a number of conditions that must be met for the licensee to continue plant operation during the term of the renewed license. Once an OL is renewed, State regulatory agencies and the owners of the plant will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the state's jurisdiction or the purview of the owners.

Thus, for license renewal reviews, the NRC has adopted the following definition of purpose and need from GEIS Section 1.3 (NRC 1996).

The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than the NRC) decisionmakers.

This definition of purpose and need reflects the Commission's recognition that, unless there are findings in the safety review required by the Atomic Energy Act of 1954 (AEA 1954) or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate. From the perspective of the licensee and the State regulatory authority, the purpose of renewing an OL is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license.

## **1.5 Compliance and Consultations**

Exelon is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. In the Quad Cities ER (Exelon 2003b), Exelon provided a list of the authorizations from Federal, State, and local authorities for current operations, as well as environmental approvals and consultations associated with renewal of the Quad Cities OLs. Authorizations and consultations most relevant to the proposed OL renewal actions are included in Appendix E.

The staff reviewed the list and consulted with the appropriate Federal, State, and local agencies to identify any compliance or permit issues or environmental issues of concern to the reviewing agencies. These agencies did not identify any new and significant environmental issues. The ER (Exelon 2003b) states that Exelon is in compliance with applicable environmental standards and requirements for Quad Cities Units 1 and 2. The staff has not identified any environmental issues that are both new and significant.

## 1.6 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

40 CFR Part 1508. Code of Federal Regulations, Title 40, *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*, Part 1508, "Terminology and Index."

Atomic Energy Act of 1954 (AEA). 42 USC 2011, et seq.

Exelon Generation Company (Exelon). 2003a. *Application for Renewed Operating Licenses, Quad Cities Units 1 and 2*. Docket Nos. 50-254 and 50-265, Warrenville, Illinois.

Exelon Generation Company (Exelon). 2003b. *Applicant's Environmental Report—Operating License Renewal Stage Quad Cities Units 1 and 2*. Docket Nos. 50-254 and 50-265, Warrenville, Illinois.

National Environmental Policy Act of 1969, as amended (NEPA). 42 USC 4321, et seq. |

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*, "Section 6.3—Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1, Washington, D.C.

## Introduction

U.S. Nuclear Regulatory Commission (NRC). 2003a. "Notice of Acceptance for Docketing of Application and Notice of Opportunity for a Hearing Regarding Renewal of Facility Operating License Nos. DPR-29 and DPR-30 for an Additional 20-Year Period." *Federal Register*. Vol. 68, No. 42, pp. 10274–10275 (March 4, 2003).

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U.S. Nuclear Regulatory Commission (NRC). 2003c. *Environmental Impact Statement Scoping Process: Summary Report—Quad Cities Units 1 and 2, Moline, Illinois*. Washington, D.C. June 16, 2003.

U.S. Nuclear Regulatory Commission (NRC). 2003d. "Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2; Notice of Availability of Draft Supplement 16 to Generic Environmental Impact Statement and Public Meeting for the License Renewal of Quad Cities Nuclear Power Station, Units 1 and 2." *Federal Register*. Vol. 68, No. 219, pp. 64372–64373 (November 13, 2003).

## 2.0 Description of the Nuclear Power Plant and Site and Plant Interaction with the Environment

Exelon Generation Company's (Exelon's) Quad Cities Plant is located on the shore of the Mississippi River near East Moline, Illinois. The plant's two units, Unit 1 and Unit 2, are operating nuclear reactors and are the subject of this action. Each nuclear reactor is a boiling water reactor (BWR) which produces steam that turns turbines to generate electricity. In addition to the nuclear units, the site features intake and discharge canals, auxiliary buildings, switchyards, and a spent fuel pool. The plant and its environs are described in Section 2.1, and the plant's interaction with the environment is presented in Section 2.2.

### 2.1 Plant and Site Description and Proposed Plant Operation During the Renewal Term

Quad Cities Units 1 and 2 are located on 331 ha (817 ac) of Exelon-owned land in Rock Island County, Illinois. Quad Cities is 32 km (20 mi) northeast of the Quad Cities Metropolitan Area of Davenport and Bettendorf, Iowa, and Rock Island, Moline and East Moline, Illinois (Exelon 2003a). The site is on the east bank of Pool 14 of the Mississippi River, between Lock and Dams 13 and 14 and approximately 810 km (506 mi) upstream from its confluence with the Ohio River. The west bank of the Mississippi River, visible from the plant site, is in Iowa. Figures 2-1 and 2-2 show the site location and features within 80 km (50 mi) and 10 km (6 mi), respectively. There are four counties within the 10 km (6 mi) radius of the site: Rock Island and Whiteside counties in Illinois and Scott and Clinton counties in Iowa. In addition to the two nuclear reactors and associated structures, the site includes a retired spray canal now used as a facility to raise game fish for release into the Mississippi River (Exelon 2003a).

The region surrounding the Quad Cities site was identified by the applicant as being in sparseness Category 4 and proximity Category 2 (Exelon 2003a), using the guidance in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup>

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the GEIS include the "GEIS" and its Addendum 1.

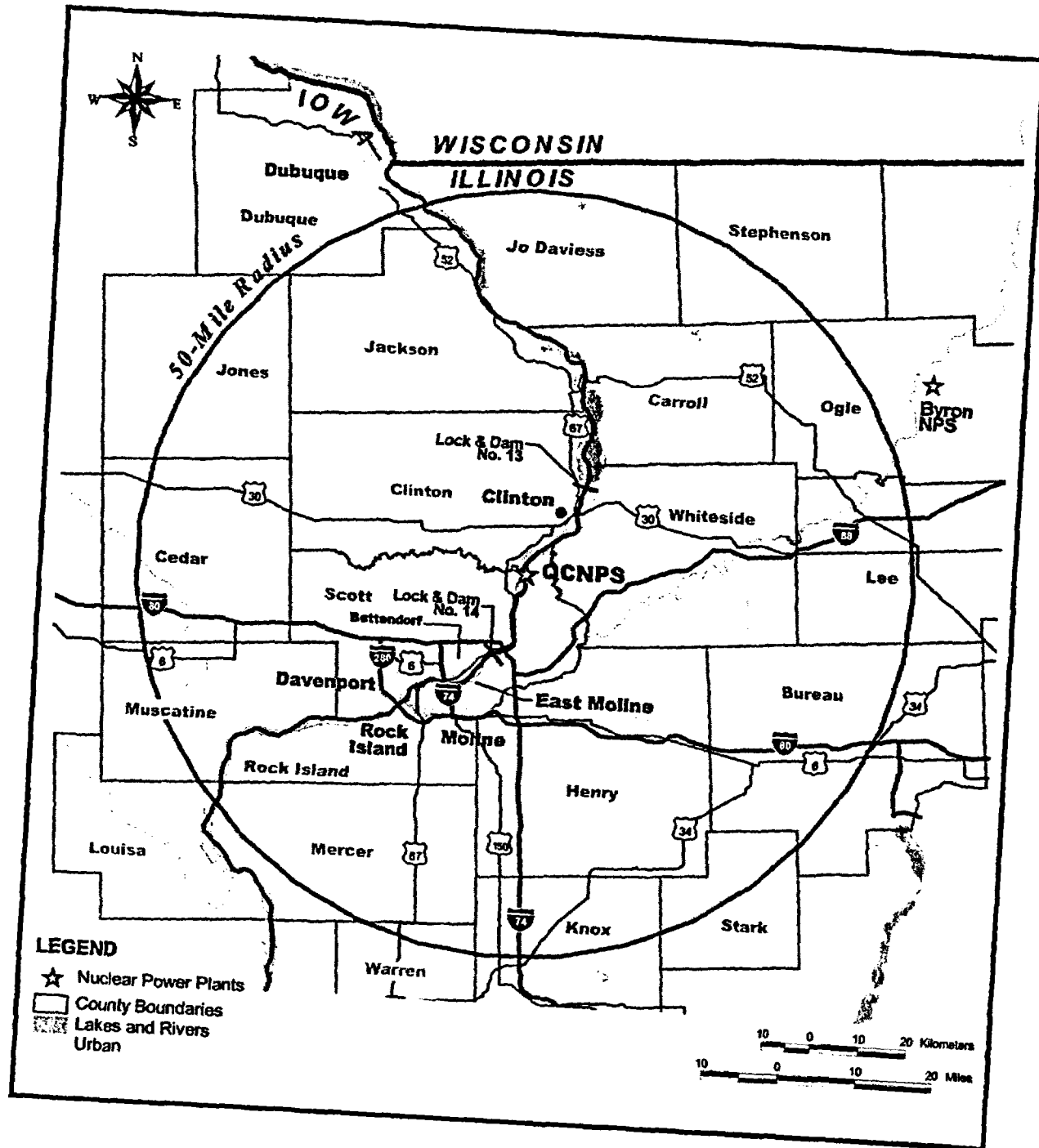


Figure 2-1. Location of Quad Cities, 80-km (50-mi) Region

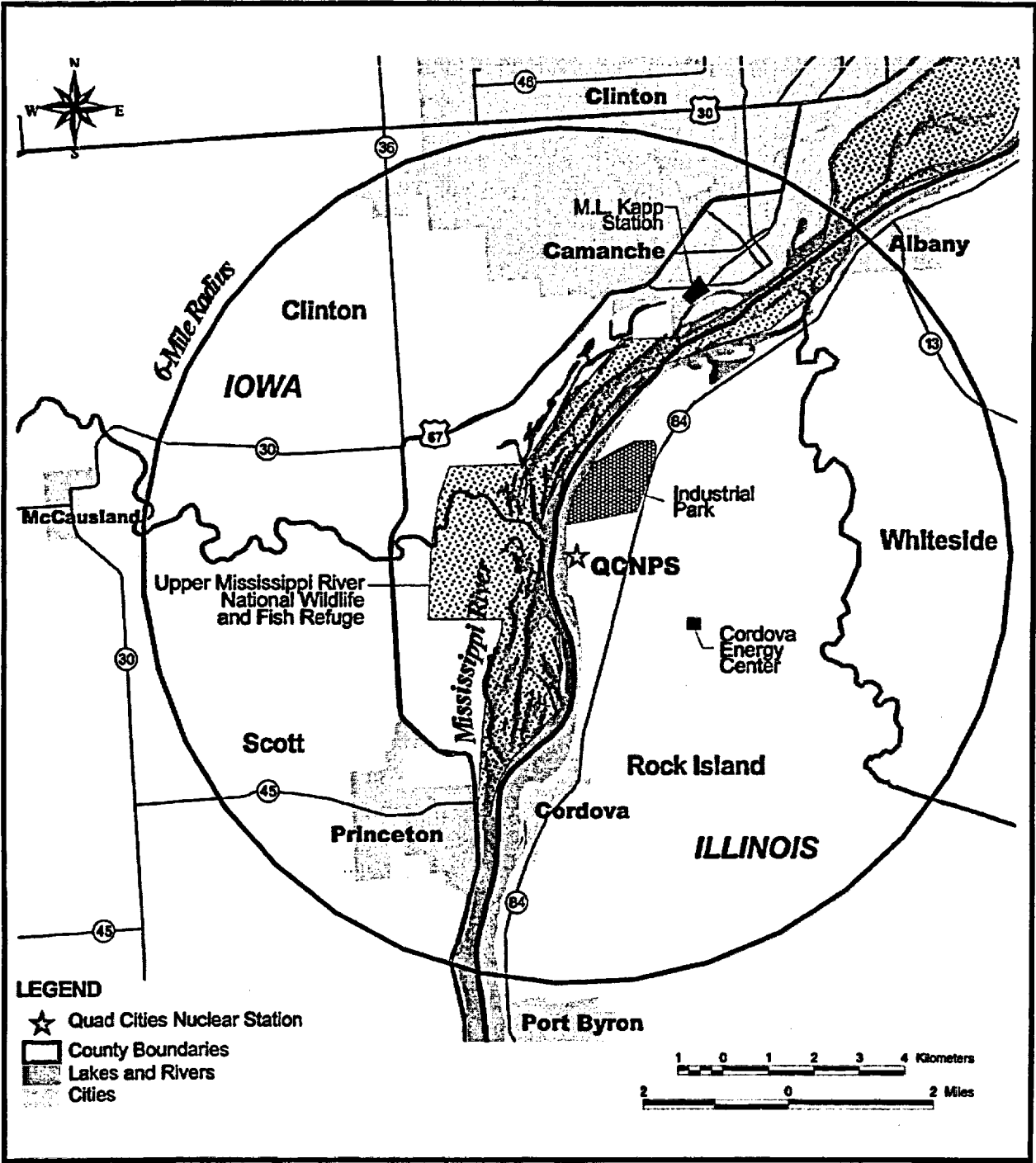


Figure 2-2. Location of Quad Cities, 10-km (6-mi) Region

### 2.1.1 External Appearance and Setting

The area surrounding the Quad Cities site is rural farmland and woods with an industrial park located 1.6 km (1 mi) north of the station, and the Cordova Energy Center, a gas-fired power plant approximately 1.6 km (1 mi) southeast of the station. The site is flat with a grade level of approximately 2.7 m (9 ft) above maximum flood stage. The Upper Mississippi River National Wildlife and Fish Refuge (NWFR), across the Mississippi River from the Quad Cities site, provides habitat for numerous plant and animal species in wood and wetland areas (Exelon 2003a). The Mississippi River is a source of municipal water and is used for commercial and sport fishing as well as recreational boating.

The major structures include the two reactors, the associated turbine buildings, and ancillary buildings, which are sheathed with metal panels colored in subdued tones, a 94.5-m (310-ft) main stack, and intake and discharge canals. Figure 2-3 identifies the main structures and the station layout. Most of the view of the station is obstructed by evergreen forest, with only the stack and transmission lines being visible from the highway (AEC 1972). The plant structures are clearly visible from the Mississippi River.

### 2.1.2 Reactor Systems

Quad Cities is a two-unit nuclear-powered steam electric plant. Each unit is a General Electric BWR that produces 2957 megawatts thermal (MW[t])<sup>(a)</sup> with a design net electrical capacity of 930 megawatts electric (MW[e]) per unit. The nuclear fuel is low-enriched uranium dioxide with enrichments below 5 percent by weight uranium-235 and fuel burnup levels less than 60,000 megawatt days per metric ton uranium (MWd/MTU). Unit 1 began commercial operation on February 18, 1973; and Unit 2 began operation on March 10, 1973 (Exelon 2003a). Refueling of the reactors is performed on a 24-month schedule with approximately 33 to 40 percent of the fuel replaced during each refueling outage. At this time, all spent fuel is placed in storage in the spent fuel pool. Exelon plans to build an independent spent fuel storage installation (ISFSI) for storage of spent fuel in dry storage casks. Exelon plans to begin use of the ISFSI in 2005.

Each unit has a primary containment consisting of a drywell, a steel structure that encloses the reactor vessel and related piping, a pressure suppression chamber containing water, and a vent system that connects the drywell to the suppression chamber. The primary containments are designed to limit the release of fission products during a loss-of-coolant accident and contain the reactor vessels, recirculating system and other key components. The reactor building is

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(a) In December 2000, Exelon submitted an application for an increase of the rated core thermal power for Quad Cities of 17.8 percent, for an uprated power level from 2511 to 2957 MW(t) (ComEd 2000). The power uprates for both units have been completed.



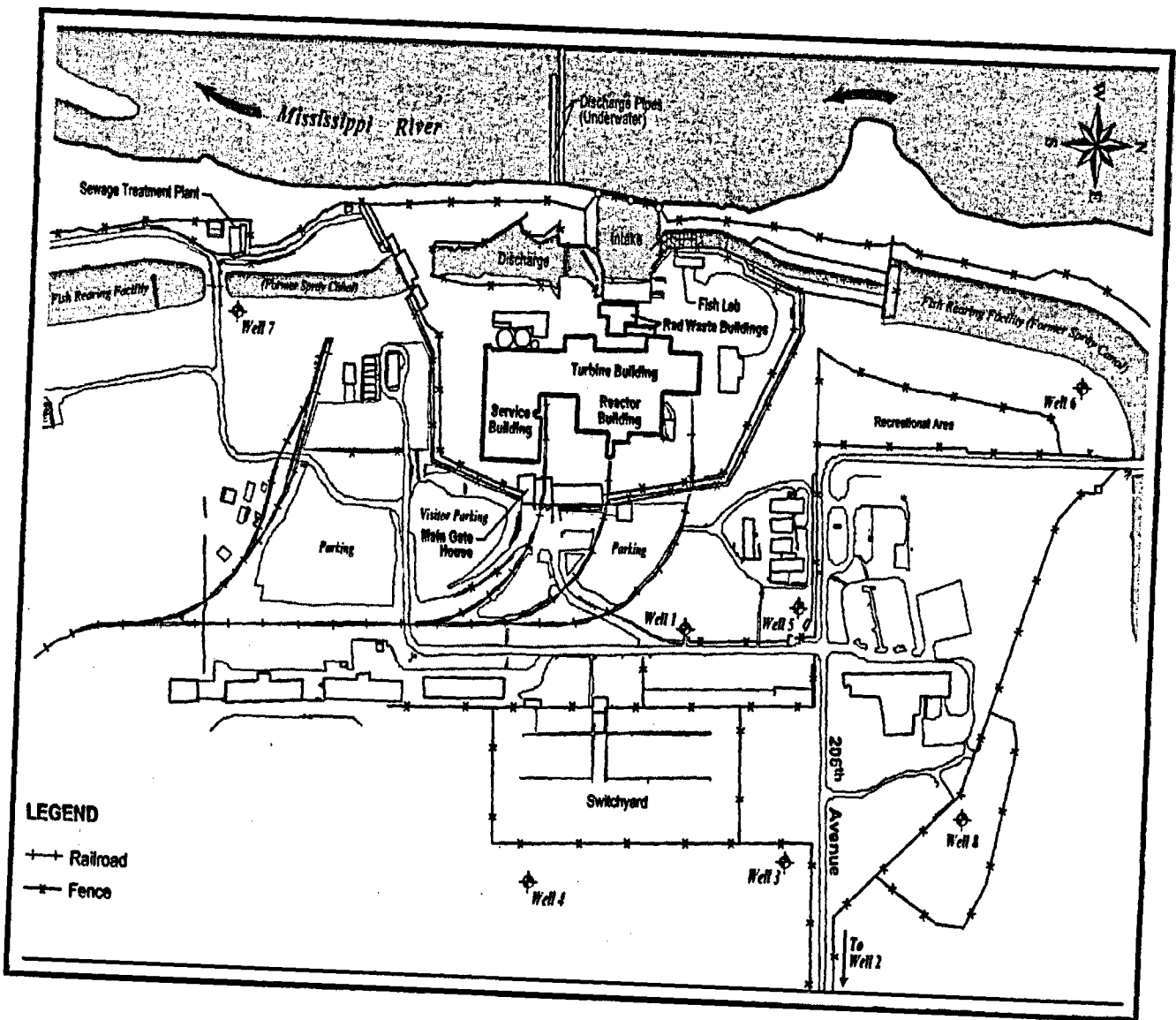


Figure 2-3. Quad Cities Site Layout

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shared by both units and contains the primary containments, reactor auxiliary systems, spent fuel storage, and a new fuel storage vault (Exelon 2003c). The concrete reactor building is maintained under a slight negative pressure and provides secondary containment and shielding. The release of the building atmosphere during an accident would be monitored and filtered (Exelon 2003a).

The turbine building is shared by Units 1 and 2 and contains the turbine-generators, exciters, condensers, feedwater and condensate pumps, condenser circulating water systems, and electrical switchgear. The radioactive waste building is a concrete structure located adjacent to the west side of the turbine building. This building is also shared by both units and contains the control, processing, packaging, and storage facilities necessary to process the solid and liquid waste (Exelon 2003c).

### 2.1.3 Cooling- and Auxiliary-Water Systems

The Mississippi River is the source for cooling and most auxiliary water systems for Quad Cities Units 1 and 2. The plant utilizes a once-through condenser cooling system drawing water from a canal intake structure located along the east side of the river and discharging through submerged piping into the main river channel (Figure 2-4). The total flow of Mississippi River water through Quad Cities Units 1 and 2 for condenser circulating water and service water is approximately 61,000 L/s (970,000 gpm). The temperature increase at the edge of the discharge mixing zone is required to be less than 2.8°C (5°F) above ambient (IEPA 2000b).

Condenser cooling water is withdrawn from the Mississippi River through a canal that is perpendicular to the river flow. The 72 m (235 ft) long canal is 55 m (180 ft) wide, and 3.6 m (12 ft) deep where it meets the river. Intake velocity at the mouth of the canal is approximately 0.3 m/s (1 ft/s). A floating boom, extending to a depth of 84 cm (33 in.), traverses the mouth of the canal to deflect floating material. At the other end of the canal, a trash rack consisting of a series of vertical metal bars spaced 6.3 cm (2.5 in.) apart screens large pieces of debris from the intake. Prior to the circulating water pumps, water flows through 12 sets of traveling screens that have a 1-cm (0.38-in.) mesh, to prevent debris and aquatic organisms from being entrained into the cooling system.

Quad Cities utilizes a two-pipe diffuser system to return cooling water to the river. The two pipes are 4.9 m (16 ft) in diameter and lie on the bottom of the river across the main river flow (Figure 2-4). The combined cooling and service water, with an increase of as much as 15.6°C (28°F) above intake temperature, is discharged into the deepest part of the river through regularly spaced jet nozzles in the pipes. When both units are operating at full power, approximately 61,000 L/s (970,000 gpm) of cooling water are discharged to the river.

The service water system provides strained water from the Mississippi River for cooling several closed-cycle cooling water systems, the recirculation motor-generator set oil coolers, the generator stator coolers, the turbine oil coolers, the generator hydrogen coolers, and other systems. It also is used to wash the circulating water traveling screens and for the fire protection system. The flow rate is variable, and maximum capacity is 4400 L/s (69,000 gpm). The service water pumps draw from the same intake system as the circulating water system. The system discharges to the plant discharge flume that leads to the diffusers.

The Quad Cities plant has used open-cycle cooling (Figure 2-4) since 1983. Between 1974 and 1983, the plant used a three-mile cooling canal with spray coolers and operated in either a closed-cycle mode or partial open-cycle mode. Since the conversion to open-cycle cooling, the canal has been converted to a fish-rearing facility. Walleye and hybrid striped bass fingerlings are reared for release into Pool 14 of the Mississippi River.

Groundwater from five wells is used for domestic water consumption, for raising fish in the former spray canals, and for other industrial purposes that do not include condenser cooling. Groundwater use has averaged 45 L/s (717 gpm) over the last 10 years. In the winter of 1997, groundwater was used to heat the water in the fish-rearing facility while the plant was shut down. Without this period of high use, the 10-year average yield for the site is approximately 31.9 L/s (505 gpm).<sup>(a)</sup>

#### 2.1.4 Radioactive-Waste Management Systems and Effluent-Control Systems

Quad Cities uses liquid, gaseous, and solid radioactive waste management systems to collect and process the liquid, gaseous, and solid wastes that are the by-products of operations, before they are released to the environment. The waste disposal systems for Quad Cities meet the design objectives of 10 CFR Part 50, Appendix I (*Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents*).

Radioactive material in the reactor coolant is the source of gaseous, liquid, and solid radioactive wastes in light water reactors. Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products are primarily contained in the sealed fuel rods, but small quantities escape from the fuel rods and contaminate the reactor coolant. Neutron activation of the primary coolant system is also responsible for coolant contamination.

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(a) Personal communication with Mark Stuhlman, Exelon Generation Company, October 3, 2003.

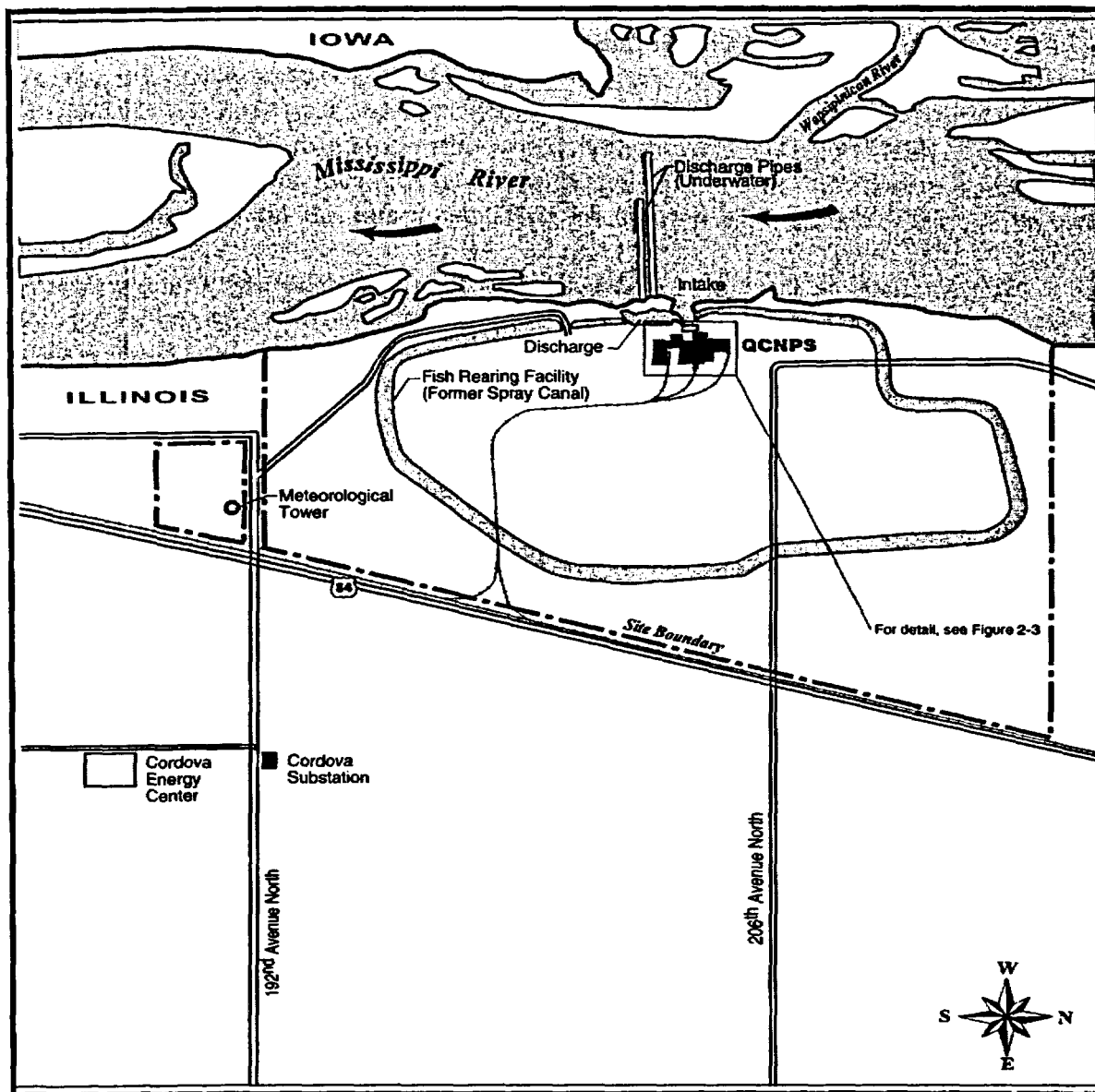


Figure 2-4. Quad Cities Site Cooling System

Nonfuel solid wastes result from treating and separating radionuclides from gases and liquids, and from removing contaminated material from various reactor areas. Solid wastes also consist of reactor components, equipment, and tools removed from service, as well as contaminated protective clothing, paper, rags, and other trash generated from plant-design modifications, operations, and routine maintenance activities. Solid wastes are shipped to a waste processor

for volume reduction before disposal at a licensed burial site. Spent resins and filters are stored or packaged for shipment to a licensed offsite processing or disposal facility.

Fuel rods that have exhausted a certain percentage of their fuel and that have been removed from the reactor core for disposal are called spent fuel. The reactor core is refueled approximately every 24 months. Currently, all spent fuel is stored in the spent-fuel pool located in the reactor building. Exelon also plans to build an ISFSI for storage of spent fuel in dry storage casks. Exelon plans to begin use of the ISFSI in 2005.

The *Offsite Dose Calculation Manual* (ODCM) for Quad Cities (Exelon 2002a) is subject to NRC inspection and describes the methods and parameters used for calculating offsite doses resulting from radioactive gaseous and liquid effluents. It is also used for calculating gaseous and liquid effluent monitoring alarm/trip setpoints for release of effluents from Quad Cities Units 1 and 2. Operational limits for releasing liquid and gaseous effluents are specified to ensure compliance with NRC regulations.

In December 2000, Exelon submitted a request for a license amendment for a power uprate at Quad Cities from 2511 to 2957 MW(t) (ComEd 2000). In December, 2001, the NRC granted Exelon a license amendment allowing an increase in power level to 2957 MW(t) for both units at Quad Cities (NRC 2001b). This power uprate was implemented at both units by the end of 2002. However, because of steam dryer cracking, the Quad Cities units did not operate at the uprated power level for much of calendar year 2003. Therefore, no data are available to assess radiological effluents for full uprate operation at Quad Cities. In December, 2001, the NRC issued an environmental assessment of the power uprate (NRC 2001a). In this assessment, the NRC estimated that the power uprate could potentially increase both gaseous and liquid radiological effluent releases by approximately 18 percent. Even if the increase in radiological effluents is as much as 18 percent because of the power uprate, Quad Cities will still meet all NRC limits for the amounts of radiological effluents that may be released. Therefore, the staff finds that the power uprate does not represent new or significant information which would cause it to revisit the GEIS' Category I determinations applicable to Quad Cities. In its finding, the staff relies on the GEIS' generic determinations regarding the environmental impacts of operation by the current fleet of reactors.

#### **2.1.4.1 Liquid-Waste Processing Systems and Effluent Controls**

The Quad Cities liquid radioactive waste system is designed to collect, treat, store, and dispose of radioactive liquid wastes. Radioactive liquid wastes are collected in sumps and drain tanks at various locations and then transferred to appropriate tanks in the radwaste building for processing, storage, and release. Liquid wastes that have been demineralized and purified and meet the criteria for reuse are recycled back into the contaminated condensate storage tank. Wastes that have come in contact with organics or other impurities that do not meet the recycle

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requirements are reprocessed or discharged. Liquid wastes meeting the requirements to be discharged are discharged from the plant to the Mississippi River with dilution from the south diffuser or discharge flume weir.

The liquid waste disposal system segregates lower-activity wastes from higher-activity wastes and is divided into four subsystems: 1) floor drains, 2) waste collector, 3) chemical waste, and 4) laundry drain. The liquid wastes from the floor drains are processed through a filter and a demineralizer and routed to the floor drain sample tanks. These wastes are usually outside the criteria for reuse and are returned to the radwaste system for reprocessing or discharged to the river. Wastes that can be reused are returned to the condensate storage station. The wastes collected in the waste collector tank are high-purity wastes with variable radioactive concentrations. These wastes are processed through a filter and one or more demineralizers, then sent to waste sample tanks. If the wastes do not meet reuse criteria, they are returned for reprocessing or discharged to the river. Wastes in the chemical waste system are from laboratory drains, leakage from reactor water cleanup and fuel pool demineralizer drain valves, and decontamination operations. These wastes may be transferred to the floor or equipment drain system or to the chemical waste sample tank. Laundry wastes are filtered and sent to the laundry sample tank for sampling and further filtering, if required, and then discharged to the river.

Liquid wastes are collected in the river discharge tank in batches and released to the river after sampling and analysis through a monitored radioactive liquid waste line, which is alarmed. The discharge from the tanks is combined with station condenser circulating water and directed to the south diffuser line or discharge flume weir. The radioactive waste discharges to the river are monitored and recorded; the monitoring system provides an alarm to operators if expected radiation levels are exceeded. Prior to release, the liquid wastes are kept in holdup tanks for radioactive decay from one hour to one week.

The radwaste system uses four deep-bed demineralizers. Radwaste filter sludges are collected in the waste sludge tank or in the condensate phase-separators. Spent resins from the waste demineralizer are collected in the waste-spent resin tank.

The power uprate to 2957 MW(t) could increase the activity in the liquid waste discharged by 18 percent due to an increase in the flow rate through the condensate demineralizers and increases in the production of fission products and activated corrosion products. Even with these increases, releases will still be within the regulatory limits of 10 CFR Part 50, Appendix I (ComEd 2000).

| During 2001, there were 17 batch releases (Exelon 2002c) with a total volume of  $5.8 \times 10^6$  L (Exelon 2002a) prior to mixing with the station condenser circulating water. In this liquid waste, there was a total fission and activation product activity of  $1.04 \times 10^9$  Bq (0.028 Ci) and a total

tritium activity of  $7.2 \times 10^{11}$  Bq (19.4 Ci). These volumes and activities are typical of the annual liquid releases for Quad Cities. The actual liquid waste generated is reported in the *Quad Cities Nuclear Power Station's Radioactive Effluent Report for January through December 2001* (Exelon 2002c). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

Exelon does not anticipate any increase in liquid waste releases on an annual average basis during the renewal period once the increase in releases due to the power uprate has taken effect.

#### **2.1.4.2 Gaseous-Waste Processing Systems and Effluent Controls**

The gaseous waste management systems at Quad Cities are designed to filter, monitor, and record the process off-gases before release through the 94.5-m (310-ft) chimney during normal and abnormal plant operation. There is also a system to monitor and record the amount of radioactive material in the air released from the reactor building through the reactor building vent stack (Exelon 2003c). The major source of gaseous effluents from Quad Cities operations are the condenser air ejector effluent and the steam-packing exhaust system effluent which include small quantities of activation gases and noble gases. The gaseous waste system is designed to effectively control and process off-gases and prevent releases over the limits specified in 10 CFR Part 50. The system minimizes releases of radioactive particles to the atmosphere, allowing short-term decay, and minimizes the hazard of explosion of hydrogen and oxygen gas in the off-gas system.

Three systems are used to process gaseous waste: (1) the off-gas system, (2) the turbine-gland seal system, and (3) the mechanical vacuum pump system. The off-gas system collects, contains, and processes the radioactive gases that come from the steam condenser and are exhausted by the steam jet ejectors. The steam is condensed and returned as condensate and the noncondensable gases are sent to a holdup pipe and then processed and sent through the high-efficiency particulate air (HEPA) filters and released through the chimney. The mechanical vacuum pump system establishes and maintains the main condenser vacuum when steam is not available. The vacuum pump effluent is discharged to the chimney (Exelon 2003c). Releases of gaseous effluents are from two release points: the 94.5-m (310-ft) chimney and the reactor building ventilation stack. Natural dispersion of gases occurs by discharge from the chimney due to the combination of height and exit velocity of the effluent and the buoyancy of the exit gases. Releases from the chimney include radioactive gases from the off-gas system, the turbine gland-seal systems, and the standby gaseous treatment system. Exhaust from the reactor building ventilation systems and the drywell ventilation and purge systems for both units are discharged from the reactor building ventilation stack (Exelon 2003c).

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The gaseous effluents released from the chimney and the reactor building stack are sampled on a continuous basis. In addition, there are provisions for sampling gaseous effluents manually at process points, such as at the steam jet air ejector or at the exit of the recombiner. The limits for release of gaseous effluents from Quad Cities are given in the ODCM. The power uprate is expected to increase the activity in gaseous effluents by approximately 18 percent. Even with this increase, releases will still be within the regulatory limits of 10 CFR Part 50, Appendix I (ComEd 2000).

During 2001, a total of  $8.9 \times 10^{12}$  Bq (240 Ci) of noble gases was released to the atmosphere. A total of  $3 \times 10^8$  Bq ( $8.1 \times 10^{-3}$  Ci) of iodine 131,  $3.3 \times 10^{12}$  Bq (89.5 Ci) of tritium, and  $7.9 \times 10^8$  Bq (0.021 Ci) of beta-gamma emitters was released in gaseous effluents. These activities are typical of the annual gaseous releases for Quad Cities. The details for these radioactive gaseous releases are reported in the *Quad Cities Nuclear Power Station 2001 Annual Radiological Environmental Operating Report* (Exelon 2002b). See Section 2.2.7 for a discussion of the theoretical doses to the maximally exposed individual as a result of these releases.

Exelon does not anticipate any increase in gaseous waste releases on an annual average basis during the renewal period once the increase in releases due to the power uprate has taken effect.

### 2.1.4.3 Solid-Waste Processing

The solid-waste management system is used to process, package, and handle wet and dry solid radioactive waste generated as a result of normal operations at Quad Cities. The process control program is used to process all low-level radioactive wet wastes to meet applicable Federal, State, and burial site requirements. For Class A unstable wastes, there is an in-plant cement solid-waste system installed, but it is not normally used. Instead, contract services are used for processing Class A unstable waste. Processing is performed in shielded and ventilated facilities to minimize personnel radiation exposure. Spent-control rod blades and fuel channels are stored in the spent fuel pool to allow for radioactive decay and then packaged and sent offsite for disposal in approved shipping containers.

In 2001, 18 shipments of solid waste were sent to the waste processor and 22 shipments went to the disposal site. For the waste stream of resins, filters, and evaporator bottoms, a volume of  $132 \text{ m}^3$  with an activity of  $2.93 \times 10^{13}$  Bq (794 Ci) was shipped in 2001. Dry, active waste shipments in that year totaled  $638 \text{ m}^3$  and had an activity of  $7.7 \times 10^{11}$  Bq (20.8 Ci). A volume of  $7.12 \text{ m}^3$  and activity of  $2.2 \times 10^{15}$  Bq ( $6 \times 10^4$  Ci) of irradiated components was shipped offsite in 2001. These volumes and activities are typical of the annual solid-waste production for Quad Cities, and the power uprate is not expected to significantly impact the estimates of shipped radioactive waste (Exelon 2003c). The actual solid waste generated is reported in the



*Quad Cities Nuclear Power Station's Radioactive Effluent Report for January through December 2001 (Exelon 2002c).*

### **2.1.5 Nonradioactive Waste Systems**

Plant effluents containing chemicals used for plant operation, such as chemicals added to cooling water, process-water streams for control of aquatic fouling and for maintenance of water quality are released from the plant by the cooling-water blowdown discharge to the river. Based on information from the 1972 Final Environmental Statement (FES) and review of recent applicant environmental reports, releases of these chemicals to the river are only a small fraction of established limits (AEC 1972; Exelon 2003a). The station has its own operable sewage treatment plant, licensed by the State of Illinois. The station monitors wastewater streams and discharges to the Mississippi River from the wastewater treatment system, the sanitary waste treatment plant, and the open-cycle diffusers, covered under NPDES Permit No. IL0005037 (Exelon 2003a).

### **2.1.6 Plant Operation and Maintenance**

Routine maintenance performed on plant systems and components is necessary for safe and reliable operation of a nuclear power plant. Maintenance activities conducted at Quad Cities include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and safety requirements. Certain activities can be performed while the reactor is operating. Other activities require that the plant be shut down. Long-term outages are scheduled for refueling and for certain types of repairs or maintenance, such as replacement of a major component. Exelon refuels each of the Quad Cities units about every 24 months on a staggered schedule. Each outage is typically scheduled to last about 20 days, and 33 to 40 percent of the core is replaced at each refueling. Approximately 1100 additional workers are onsite during a typical reactor outage.

Exelon performed an aging management review and developed an integrated plant assessment (IPA) for managing the effects of aging on systems, structures, and components in accordance with 10 CFR Part 54. The aging management program is described in the *Application for Renewed Operation Licenses, Quad Cities Nuclear Power Station, Units 1 and 2, Appendix B* (Exelon 2003b). The IPA identified the programs and inspections that are managing the effects of aging at Quad Cities Units 1 and 2. Exelon expects to conduct activities related to the management of aging effects during plant operation or during normal refueling and other outages, but no outages specifically for refurbishment activities are planned. Exelon has no other plans to add additional full-time staff (non-outage workers) at the plant during the license renewal period.

### 2.1.7 Power Transmission System

Four 345-kV transmission lines connecting Quad Cities Units 1 and 2 to the transmission system were identified in the FES for operation of Quad Cities Units 1 and 2 (AEC 1972). These lines included a pair of lines extending east to the Nelson substation in Illinois (Nelson lines), a line to the Iowa-Illinois Gas and Electric Company's substation 39 in Rock Island County, Illinois (Barstow line), and a line to substation 56 near Davenport, Iowa (Davenport line). According to the FES, the lines to substations 39 and 56 were planned and would have been to an alternate source of power in the area had Quad Cities Units 1 and 2 not been built. The FES only considers the impact of the lines to the Nelson substation. Potential electric shock impacts of the Barstow and Davenport lines, which were built along slightly different rights-of-way, were not considered in the FES.

Exelon describes changes that have been made since 1972 in the way that Quad Cities Units 1 and 2 are connected to the transmission system (Exelon 2003a). Quad Cities Units 1 and 2 are now connected to the transmission system by five lines. The Davenport line now connects the plant to the transmission system at a new substation (substation 91) about 21 km (12.8 mi) from the Quad Cities plant. In 2000, a new substation was built on the Barstow and southern Nelson lines about 3 km (2 mi) southeast of the Quad Cities site. A new 345-kV line (the Rock Creek line) has been constructed from Quad Cities Units 1 and 2 to the Rock Creek substation on the north side of the Mississippi River near Comanche, Iowa. The Nelson line currently terminates at the Northwest Steel and Wire substation, 33 miles from the Quad Cities plant.

The transmission lines considered to be within the scope of this review include the entire lengths of the four transmission lines described in the FES (AEC 1972) and the new line to the Rock Creek substation. These lines and their corridors are shown in Figure 2-5 and listed in Table 2-1. The corridors have a total length of approximately 185 km (115 mi) and cover approximately 880 ha (2200 ac). The Davenport (0401) and Barstow (0402) lines are owned and operated by the MidAmerican Energy Company; the two lines to the Nelson substation (0403 and 0404) are owned and operated by Commonwealth Edison Company (ComEd); and the Rock Creek line (0405) is owned and operated by Alliant Energy (Exelon 2003a).

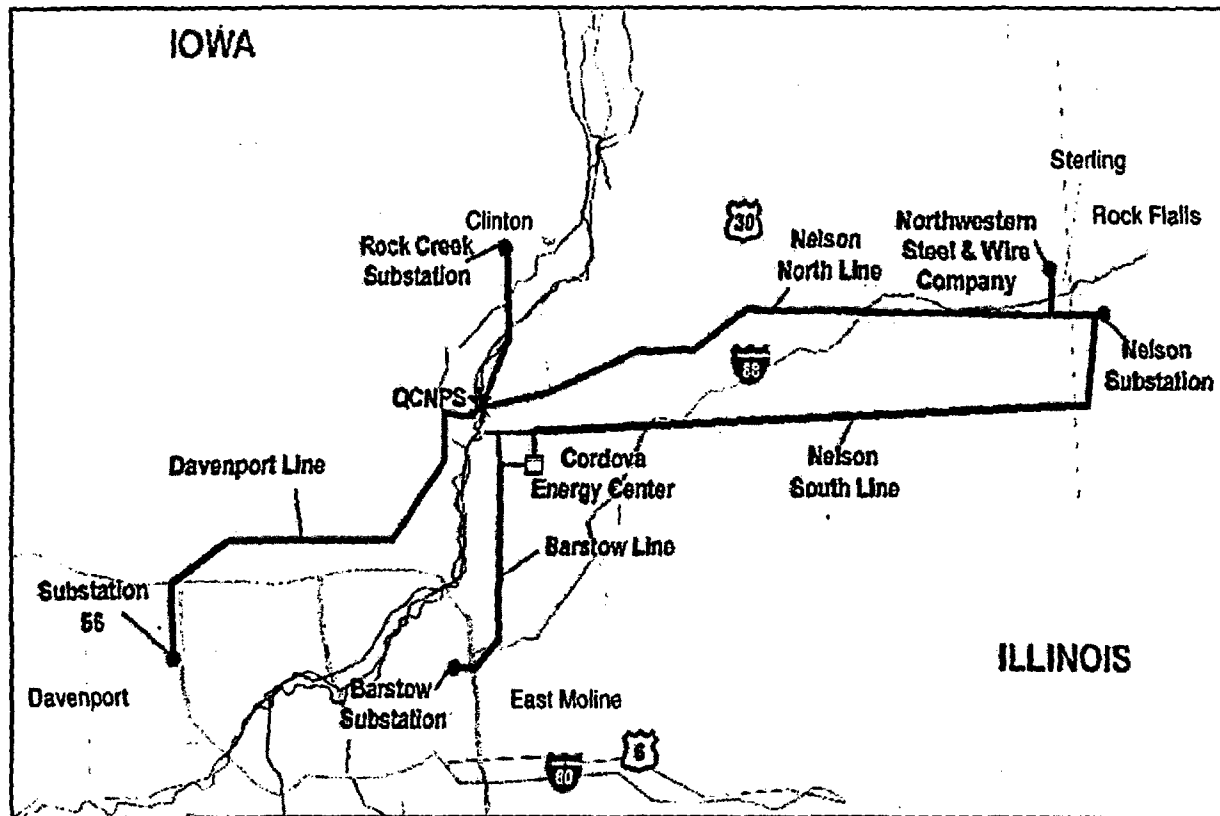


Figure 2-5. Quad Cities Units 1 and 2 Transmission Lines

The Davenport transmission line passes through the Upper Mississippi River NWFR and the Princeton State Wildlife Management Area (in Iowa, managed by the Upper Mississippi River NWFR). Except for these two areas, the transmission line corridors generally pass through agricultural lands cultivated for row crops and pasture that are typical of eastern Iowa and northwestern Illinois. The Davenport and Rock Creek transmission lines cross the Mississippi River, although for a very short distance, and the two Nelson lines cross the Rock River. All five of the lines cross other small creeks and their tributaries.

**Table 2-1. Quad Cities Transmission Line Corridors**

Substation (line)	Number of Lines	kV	Approximate Corridor Length		Corridor (Right-of-Way) Width		Estimated Corridor Area	
			km	(mi)	m	(ft)	ha	(ac)
Davenport (0401)	1	345	20.6	12.8	55	180	110	280
Barstow (0402)	1	345	28.1 <sup>(a)</sup>	17.5 <sup>(a)</sup>	158, 44 <sup>(b)</sup>	520, 145 <sup>(b)</sup>	160 <sup>(c)</sup>	400 <sup>(c)</sup>
Nelson (South line 0403)	1	345	67.4 <sup>(a)</sup>	41.9 <sup>(a)</sup>	158, 44 <sup>(b)</sup>	520, 145 <sup>(b)</sup>	330 <sup>(c)</sup>	830 <sup>(c)</sup>
Nelson (North line 0404)	1	345	63.9	39.7	44	145	280	700
Rock Creek (0405)	1	345	8.0	5	52	170	40	100
Total	5		185	115			880	2200

Source: Exelon 2003a (Note: Totals are derived based on information in the ER.)

(a) The initial 3.2 km (2 mi) of corridor is shared by Barstow and Nelson South lines. The initial 3.2 km is counted once in the total.

(b) The initial 3.2 km (2 mi) of the corridor is 158 m (520 ft) wide.

(c) The area includes the area of the shared corridor but this area is only included once in the total.

The transmission corridors are maintained by trimming and mowing, and by the use of approved herbicides (Cunningham 2003; Exelon 2003a; Exelon 2003d; Exelon 2003e). Vegetation management follows a three-to-six-year cycle (Cunningham 2003; Exelon 2003e).

## 2.2 Plant Interaction with the Environment

Sections 2.2.1 through 2.2.8 provide general descriptions of the environment near Quad Cities Units 1 and 2 as background information. They also provide detailed descriptions where needed to support the analysis of potential environmental impacts of refurbishment and operation during the renewal term, as discussed in Chapters 3 and 4. Section 2.2.9 describes the historic and archaeological resources in the area, and Section 2.2.10 describes possible impacts associated with other Federal project activities.

## 2.2.1 Land Use

The Quad Cities site is located in the Upper Mississippi Basin, on the Illinois side of the Mississippi River approximately 80 km (50 mi) south of the northern boundary of the State of Illinois and 810 km (506 mi) upstream from its confluence with the Ohio River. The site is on moderately high ground that rises abruptly from the surface of the river to form bluffs between 6 m (20 ft) and 12 m (40 ft) high. It is situated in the Meredosia Channel, an ancient channel of the Mississippi River. The topography of the site is flat, with an elevation of 7 m (23 ft) above normal river level and a grade level approximately 2.7 m (9 ft) above the maximum recorded flood stage over a 102-year period. The river flow of the adjacent Pool 14 (an approximately 40-km [25-mi] section), between Lock and Dam 13 and Lock and Dam 14 is controlled below flood stage.

Approximately 40 ha (100 ac) of the western and northern portions of the Quad Cities site (Figure 2-3), are industrial in character, containing the major generating facilities, switchyard, warehouses, training center, offices, parking lots, and roads. Approximately 40 ha (100 ac) of forests, including areas of planted pines along Illinois State Route 84, and 211 ha (527 ac) of open fields and scrub woodlands occupy most of the eastern and southern portions of the site. The retired spray canal, approximately 5 km (3 mi) long and 76 m (250 ft) wide, surrounds the plant and occupies approximately 36 ha (90 ac); it is now utilized as a fish-rearing facility (Exelon 2003a). A publicly available, paved bicycle trail passes along the eastern edge of the site property, adjacent to Route 84. The Rock Island County Land Use Plan designates the site area as industrial use (Rock Island County 1998).

## 2.2.2 Water Use

The Mississippi River is the source for cooling and most auxiliary water systems. Quad Cities Units 1 and 2 utilize a once-through condenser cooling system. The total design flow of Mississippi River water through Quad Cities Units 1 and 2 for condenser circulating water and service water is 61,000 L/s (970,000 gpm, or 2,160 cfs). At Camanche, Iowa, approximately 10 km (6 mi) upstream of the Quad Cities site, the Mississippi River has an annual mean flow of 1,380,000 L/s (48,750 cfs) (USGS 2000). The Wapsipinicon River flows into the Mississippi River from the west immediately upstream of the Quad Cities site, contributing an additional 48,000 L/s (1700 cfs) (USGS 2000), bringing the average river flow at the Quad Cities site to 1,430,000 L/s (50,500 cfs).

In addition, there are currently five operating wells (Figure 2-3) providing water to various systems on the property. The two primary wells for station operations are Wells 1 and 5. These wells provide water for the domestic drinking water system, make-up demineralizer system, and gland-seal condenser. The largest single use of groundwater is to maintain the former spray canal for raising fish. Water for this purpose is drawn from Well 6 and Well 7.

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The final well, Well 8, provides water for fire fighter training exercises. Wells 2, 3, and 4 have been capped or abandoned.

Groundwater use from all wells has averaged 45 L/s (717 gpm) over the last 10 years. In the winter of 1997, groundwater was used to raise the temperature of the water in the fish-rearing facility while the plant was shut down. Without this period of high use, the 10-year average yield for the site is approximately 31.9 L/s (505 gpm).

There is no water piped to the facility from offsite water supply systems. Movement of groundwater at the site typically is toward the Mississippi River, except for short periods associated with high river level.

### 2.2.3 Water Quality

Quad Cities operates with approximately 61,000 L/s (970,000 gpm) discharged to the river with two units running at full power. The combined cooling and service water, heated 15.6°C (28°F) above the intake temperature, is discharged through two 4.9-m (16-ft) diameter diffuser pipes with nozzles that jet the water into the deepest part of the river channel. Biocides, chlorine, and bromine, are used at the condenser inlets to minimize aquatic growth and bacteria in the condenser tubes. Quad Cities injects a chemical to neutralize the biocide in the discharge bay so that river organisms are not affected by the biocide. A silt dispersant and scale inhibitor are also injected at the river intake. Additionally, biocide, silt dispersant, and a corrosion inhibitor are injected into the service water system.

Sanitary waste from the Quad Cities site is sent to the wastewater treatment system and discharged to the Mississippi River.

In addition to serving the cooling needs of Quad Cities Units 1 and 2, the Upper Mississippi River provides water of sufficiently high quality to serve a variety of other uses, including propagation of fish and wildlife and contact recreation. However, river reach IL-M04, which includes a portion of Pool 14, is identified on the Illinois State 2002 Section 303(d) list of impaired water due to the presence of polychlorinated biphenyls (PCBs).

Pursuant to the Federal Water Pollution Control Act of 1977, also known as the Clean Water Act (CWA), the water quality of the plant effluents is regulated through the National Pollutant Discharge Elimination System (NPDES). The Illinois Environmental Protection Agency (IEPA) is authorized to issue NPDES permits. The current permit (IL0005037) was issued May 26, 2000, and is due to expire May 31, 2005 (IEPA 2000b). This permit specifies effluent limits for pH, total residual chlorine, oil, grease, biological oxygen demand, fecal coliform, total suspended solids, boron, temperature, and flow. Any new regulations promulgated by the U.S. Environmental Protection Agency (EPA) or the State of Illinois would be reflected in future

permits. The Iowa Department of Natural Resources (IA DNR) is also a signatory on the original Illinois NPDES permit, as the effluents discharge to the waters of both states.

The NPDES permit for Quad Cities defines a mixing zone as an area of the river where plant releases mix with river water. The plant is required not to exceed the temperature criteria specified in the NPDES permit outside the mixing zone. To ensure compliance with State of Illinois water quality standards, the NPDES permit for Quad Cities contains monthly maximum temperature limits for "representative locations in the main river" at the edge of the designated mixing zone, a maximum temperature increase 2.8°C (5°F) above ambient at the edge of the mixing zone, and restrictions on the size of the thermal mixing zone (IEPA 2000b).

The NPDES permit for Quad Cities also contains specific requirements for daily continuous monitoring of plant circulating water flows, daily continuous monitoring of discharge temperatures, weekly determination of river flow rate, daily monitoring of the ambient temperature of the river, daily determination of plant load (percent power), and, as warranted, daily determination of the temperature at a river cross-section 152 m (500 ft) downstream from the plant's diffuser system. This monitoring program allows Quad Cities to respond to changing conditions in the river and to adjust power levels to ensure compliance with NPDES temperature limits (IEPA 2000b).

Based on a study of the diffuser system, Exelon concluded that Quad Cities Units 1 and 2 could operate at full load without violating discharge permit limits under most river flow conditions (ComEd 1981). To demonstrate compliance at low river flows, Exelon developed a temperature monitoring curve that allowed calculation of permissible plant load as a function of river flow. With these data and the lack of biological effects in the river, as demonstrated by ongoing monitoring, the parties agreed in 1983 to allow open-cycle operation (Open-Cycle Agreement 1983). The temperature monitoring curve was last modified in 2001 to more accurately represent current conditions. The curve may continue to be modified over the license renewal period, under agreement with the affected parties.

#### **2.2.4 Air Quality**

The area in the vicinity of the Quad Cities site has a temperate continental climate with a wide temperature range throughout the year. Climatological records for Moline, Illinois, which is about 40 km (25 mi) southwest of the Quad Cities site, are generally representative of the Quad Cities site. These records indicate that the normal daily maximum temperatures for Moline range from about -2°C (28°F) in January to a high of about 30°C (86°F) in July. Normal minimum temperatures range from about -12°C (11°F) in January to about 18°C (65°F) in July.

The average precipitation is about 99 cm (39 in.) per year. Of this total, about 73 cm (29 in.) falls during the growing season (March through September). There is an average of

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approximately 51 thunderstorms per year in the area, with about 50 percent of the thunderstorms occurring in July and August. Based on statistics for the 30 years from 1954 through 1983 (Ramsdell and Andrews 1986), the probability of a tornado striking the site is expected to be about  $4 \times 10^{-4}$  per year.

Wind energy potential is generally rated on a scale of 1 through 7. Areas suitable for wind turbine applications have a rating of 3 or higher. The wind energy potential in the immediate vicinity of the Quad Cities site, which has a rating of 2, may not be suitable for wind energy applications. However, there are areas in Illinois and Iowa where the annual average wind-energy resource is rated 3 or higher and is generally suitable for generation of electricity (Elliott et al. 1986). The wind energy potential for Illinois is estimated to be about 9000 MW (NREL 2003), which is higher than the 1986 estimate.

The Quad Cities site is located within the Metropolitan Quad Cities Interstate Air Quality Control Region. The air quality in the region is designated as better than national standards, in attainment, or unclassified for all criteria pollutants in 40 CFR 81.314 and 40 CFR 81.316. In addition, air quality in all counties in Illinois and Iowa within 80 km (50 mi) is designated as better than national standards, in attainment, or unclassified for all criteria pollutants in 40 CFR 81.314 and 40 CFR 81.316. There is no mandatory Federal Class I area in which visibility is an important value as designated in 40 CFR Part 81 within 160 km (100 mi) of the Quad Cities site.

Diesel generators, boilers, and other activities and facilities associated with Quad Cities Units 1 and 2 emit various pollutants. Emissions from these sources are regulated under Permit 161807AAB issued by the IEPA (IEPA 2000a).

### 2.2.5 Aquatic Resources

The principal aquatic resources in the vicinity of the Quad Cities site are associated with the Mississippi River. Other important aquatic habitats include several tributaries to the Mississippi River (e.g., the Wapsipinicon River in Iowa that flows into the Mississippi River immediately upstream of the Quad Cities site) and the Quad Cities Units 1 and 2 retired spray canal. The spray canal is currently used to raise walleye (*Stizostedion vitreum*) primarily for release into Pool 14 of the Mississippi River. The transmission lines associated with the Quad Cities Units 1 and 2 cross a number of streams ranging in size from small intermittent streams to the Rock River. Transmission line right-of-way maintenance activities in the vicinity of streams and river crossings employ procedures to minimize erosion and shoreline disturbance while encouraging vegetative cover.

Quad Cities Units 1 and 2 are located on the east bank of Pool 14 of the Mississippi River upstream of Lock and Dam 14. Pool 14 is 47 km (29 mi) long and 4165 ha (10,580 ac) in area (Bowzer and Lippincott 2000). The main channel of the river is approximately 0.6 km (0.4 mi)



wide in the vicinity of the Quad Cities site. The Mississippi River is used for a variety of purposes, including navigation, recreation, tourism, and conservation.

Since 1938 (the year that the current lock and dam system was put in place) the annual flow rate in the Mississippi River has varied from 752.6 to 2619 m<sup>3</sup>/s (26,579 to 92,500 cfs) at Clinton, Iowa (USGS 2003a). Flows at the Quad Cities site are about one percent higher due to the contribution of the Wapsipinicon River (AEC 1972). The highest flow rates generally occur in spring (April–June) and the lowest in winter (December–February), with mean monthly flow rates ranging from 732 m<sup>3</sup>/s (25,840 cfs) in January to 2551 m<sup>3</sup>/s (90,080 cfs) in April (USGS 2003c). Daily flow rates have ranged from a low of 272 m<sup>3</sup>/s (9,600 cfs) on December 5, 1976 to a high of 7589 m<sup>3</sup>/s (268,000 cfs) on April 23, 2001 (USGS 2003b). The flow of the Mississippi River through Quad Cities Units 1 and 2 for cooling and service water is about 61,000 L/s (970,000 gpm or 2,160 cfs). This is about 4 percent of mean average flow in the river (Section 2.1.3). Sedimentation is one of the most critical resource problems affecting the impounded areas within the Upper Mississippi River, which continues to degrade the quantity and quality of non-channel aquatic habitats. Sediments tend to settle in the deeper portions of the aquatic habitats, which results in a continued loss of depth diversity and simplification of pools (USGS 1999).

The major changes and modifications within the Upper Mississippi River that have had the greatest effect on aquatic resources include: (1) loss of flood plain connectivity due to extensive levee construction, (2) impoundment of the river from construction of locks and dams, (3) river channelization related to navigation, (4) water quality degradation in tributary streams, and (5) invasion of exotic species through man-made navigation projects (UMRCC 1993). The main channel of the Mississippi River is dredged in some reaches to maintain the 2.7-m (9-ft) navigation channel (Fremling and Drazkowski 2000). While pollution from domestic sewage has been reduced since passage of the Federal Water Pollution Control Act of 1972, the Mississippi River still receives contaminants from agricultural, industrial, municipal, and residential sources. The impacts of these contaminants on river biota are largely unknown (Fremling and Drazkowski 2000).

Despite the modifications and multiple competing uses of the Upper Mississippi River, the overall fish biodiversity has been persistent and resilient (USGS 1999). The river's main channel, navigation and wing dams, side channels, sloughs, chutes, backwater lakes and ponds, marsh areas, flooded bottomland forests, and tributaries create diverse habitats for at least 118 species of fish (FWS 1991a). However, overwintering habitats for fish have declined due to water depth reductions caused by sedimentation. Also, recent die-offs of aquatic vegetation have reduced the suitability of many areas as nursery habitats for fishes (Fremling and Drazkowski 2000).

Fish species considered abundant within the Upper Mississippi River include gizzard shad (*Dorosoma cepedianum*), common carp (*Cyprinus carpio*), emerald shiner (*Notropis*

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*atherinoides*), river shiner (*N. blennius*), bullhead minnow (*Pimephales vigilax*), and bluegill (*Lepomis macrochirus*). Common species include longnose and shortnose gar (*Lepisosteus osseus* and *L. platostomus*), bowfin (*Amia calva*), mooneye (*Hiodon tergisus*), spottail shiner (*N. hudsonius*), river carpsucker (*Carpionodes carpio*), quillback (*C. cyprinus*), bigmouth buffalo (*Ictiobus cyprinellus*), shorthead redhorse (*Moxostoma macrolepidotum*), channel catfish (*Ictalurus punctatus*), white and hybrid white bass (*Morone chrysops* and *M. chrysops* x *M. saxatilis*), rock bass (*Ambloplites rupestris*), green sunfish (*Lepomis cyanellus*), and river darter (*Percina shumardi*) (Bowzer and Lippincott 2000; FWS 1991a). Favorite sport fish species include walleye, sauger (*Stizostedion canadense*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), white bass, bluegill, black and white crappie (*Pomoxis nigromaculatus* and *P. annularis*), pumpkinseed (*L. gibbosus*), and channel catfish (FWS 1991a). Commercial fisheries also exist for some species, such as the bigmouth buffalo, common carp, catfish and bullheads, and freshwater drum (*Aplodinotus grunniens*) (FWS 1991a). The carp is the most important non-native fish species in the Mississippi River, comprising most of the commercial harvest; it is the dominant species in the Upper Mississippi River (USGS 1999). Ninety-two fish species have been collected in Pool 14 of the Mississippi River (Bowzer and Lippincott 2000).

The abundance of walleye and hybrid striped bass has increased in the vicinity of the Quad Cities site since 1985 due to stocking of these fish (Bowzer and Lippincott 2000; LaJeone and Monzingo 2000). The walleye are reared in the Quad Cities Units 1 and 2 inactive spray canal, while the hybrid white bass are maintained in the fish laboratory at the Quad Cities site (Exelon 2003a). Conservatively, the adult walleye population in Pool 14 is comprised of 30 percent stocked fish, with lesser, yet measurable contributions to downstream pools (LaJeone and Monzingo 2000). Riverine species, such as the freshwater drum, channel catfish, flathead catfish (*Pylodictis olivaris*), and white bass have generally increased in Pool 14; while backwater species, such as white and black crappies have generally decreased due to degradation of the backwater areas and sloughs from sedimentation associated with operation of the 2.7-m (9-ft) navigation channel (Bowzer and Lippincott 2000).

Due to the importance of vegetation as both a food and habitat resource, and its influence on physicochemical conditions in the river, the status of aquatic and terrestrial vegetation has been documented within the Upper Mississippi River. For example, wild celery (*Vallisneria americana*) produces a vegetative tuber that is important as a food item for migratory waterfowl. It became the dominant submersed plant around 1960 within much of the river between Pools 4 and 19. Purple loosestrife (*Lythrum salicaria*) is an introduced wetland plant that forms dense monotypic stands, replaces many native wetland plants, and has no food value for wildlife. Introduced submersed species, such as Eurasian water milfoil (*Myriophyllum spicatum*) cause nuisance problems throughout the river system (Fremling and Draskowski 2000). Kohrt (1999) summarized the status of vegetation in Pool 14 of the Mississippi River over three growing seasons. Wild celery demonstrated a greatly increasing trend. Other plant species or groups whose status showed an increasing trend over three growing seasons included: submersed

aquatic plants, arrowhead (*Sagittaria* spp.), purple loosestrife, and Eurasian water milfoil. Those plant species or groups whose status was static over those three growing seasons included: floating-leaved aquatic plants, emergent aquatic plants, terrestrial plants, forest plants, and sago pondweed (*Potamogeton pectinatus*). Factors that affect submersed aquatic vascular plants include weather and hydrology, sedimentation, suspended solids and water clarity, and consumption and disturbance by fish and wildlife. The impoundments for the navigation system on the Mississippi River favor submersed aquatic vegetation by increasing shallow water surface area and stabilizing low-discharge water levels (USGS 1999).

Generally, benthic macroinvertebrate densities are low throughout the Upper Mississippi River, but site-specific areas of high density do occur. The non-channel areas of the Upper Mississippi River consistently support more benthic macroinvertebrates than the channel areas (USGS 1999). The impoundments in the Mississippi River have provided habitat for hexagenian mayflies that thrive in areas where there is a silt bottom and well-oxygenated water. These mayflies are an important food resource for many fish and wildlife species. However, their populations will decrease as pool areas and backwaters are lost to sedimentation (Fremling and Drazkowski 2000).

The Upper Mississippi River contains a rich assemblage of freshwater mussels. Historically, as many as 50 species of mussels have been documented from the Upper Mississippi River, but only 30 species have been reported in recent surveys. Two of these are listed as Federally endangered; and most of the rest are rare (i.e., listed as endangered, threatened, rare, or of special concern by one or more states [USGS 1999]). The freshwater mussels have been adversely impacted by activities such as the pearl button and cultured pearl industries, siltation (associated with agriculture, poor land management, and impoundments), pollution from agricultural and industrial chemicals, establishment and maintenance of the navigation channel, and competition from exotic species, particularly the zebra mussel (*Dreissena polymorpha*) (Exelon 2003a; USGS 1999). A high mussel die-off occurred in Pools 14 and 15 in the 1980s, but the cause was not identified (USGS 1999).

Mussels are often found in dense aggregations called mussel beds. While these beds may be miles apart, an individual bed can be up to several miles long (USGS 1999). Thirty-one species of unionid have been collected from Pool 14. The most abundant species include threeridge (*Amblema p. plicata*; 37.9 percent), pimpleback (*Quadrula p. pustulosa*; 16.4 percent), plain pocketbook (*Lampsilis cardium*; 10.1 percent), Wabash pigtoe (*Fusconaia flava*; 6.2 percent), threehorn wartyback (*Obliquaria reflexa*; 5.8 percent), mapleleaf (*Quadrula quadrula*; 4.8 percent), and giant floater (*Pyganodon grandis*; 4.5 percent) (Exelon 2003a). These species are widespread and relatively common throughout the Mississippi River and its tributaries (Cummings and Mayer 1992). Populations of fingernail clams (Sphaeriidae) have declined in certain reaches of the Upper Mississippi River during recent decades. The declines

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have occurred chiefly during low-flow periods associated with droughts (Fremling and Drazkowski 2000).

The zebra mussel became established in the Upper Mississippi River by 1992 and has continued to spread throughout the river system. Their increase causes a decline among many native mussels, as it can out-compete native species for oxygen and food and is so prolific that it can smother native mussel beds (FWS 2001c). The zebra mussel has also increasingly displaced other macroinvertebrates, such as hydropsychid caddisflies that live on submerged hard surfaces (Fremling and Drazkowski 2000).

Aquatic species that are listed by the FWS, the State of Illinois, or the State of Iowa and that have the potential to occur in the vicinity of Quad Cities site are presented in Table 2-2.

The Higgins' eye pearlymussel (*Lampsilis higginsii*) was listed as a Federally endangered species on June 14, 1976 (41 FR 24064) (FWS 1976). It is only found in the Mississippi River, St. Croix River in Wisconsin, the Wisconsin River, and the Rock River in Illinois. It was never abundant, historically comprising only about 0.5 percent of the mussel population. At the time the original recovery plan was written in 1983, the Higgins' eye pearlymussel had undergone a 53 percent decrease in its known range (FWS undated). The Higgins' eye pearlymussel most frequently occurs in medium to large rivers with current velocities of about 0.15 to 0.46 m/s (0.49 to 1.51 ft/s) and in depths of 1.0 to 6.0 m (3.3 to 19.7 ft) with firm, coarse sand or mud-gravel substrates (FWS 2000a, 2001b). It is generally found in mussel beds with at least 15 other species present (FWS 2003b).

**Table 2-2.** Federally Listed and Illinois and Iowa State-Listed Aquatic Species Potentially Occurring in Rock Island and Whiteside Counties, Illinois, and Clinton and Scott Counties, Iowa

Scientific Name	Common Name	Federal Status	Illinois Status	Iowa Status
<i>Cumberlandia monodonta</i>	spectaclecase	—	E	E
<i>Ellipsaria lineolata</i>	butterfly	—	T	T
<i>Lampsilis higginsii</i>	Higgins' eye pearlymussel	E	E	E
<i>Ligumia recta</i>	black sandshell	—	T	—
<i>Plethobasus cyphus</i>	sheepnose	—	E	E
<i>Acipenser fulvescens</i>	lake sturgeon	—	E	E
<i>Ammocrypta clarum</i>	western sand darter	—	E	T
<i>Hybopsis amnis</i>	pallid shiner	—	E	—

E = Endangered; T = Threatened; — = Not listed or not afforded protection

Sources: FWS (2000b, 2001a, 2003c); Herkert (1992, 1998); IA DNR (2002); IL DNR (1999); Upper Mississippi River NWFR (undated).

No critical habitat has been designated for the Higgins' eye pearl mussel. However, ten Essential Habitat Areas for the Higgins' eye pearl mussel occur within the Upper Mississippi River watershed. Essential Habitat Areas are locations known to contain reproducing populations of the Higgins' eye pearl mussel in association with a healthy and diverse unionid community (e.g., mussel beds) (FWS 1998). An Essential Habitat Area begins approximately 1.6 km (1.0 mi) downstream of Quad Cities, Units 1 and 2 at River Mile (RM) 505.5 and continues to RM 503.0 at Cordova, Illinois (FWS 2003b).

The only other Essential Habitat Area located downstream of the Quad Cities site occurs in Pool 15 in the Sylvan Slough at RMs 485.5 through 486.0. The other Essential Habitat Areas are in Pools 9 and 10 of the Mississippi River, St. Croix River, and the Wisconsin River (FWS 2003b). Nearly all of the remaining habitat for the Higgins' eye pearl mussel within the Mississippi River occurs within the navigation channel. In a 2000 Biological Opinion, the FWS concluded that the continued operation and maintenance of the navigation channel would jeopardize the continued existence of the Higgins' eye pearl mussel (FWS 2000a).

Suitable host species for the glochidia (mussel larvae) of the Higgins' eye pearl mussel include sauger, freshwater drum, largemouth bass, smallmouth bass, walleye, yellow perch (*Perca flavescens*), and black crappie; while marginal host species include bluegill, northern pike (*Esox lucius*), and green sunfish (FWS 2003b). Most of these fish species are common to abundant and widespread; thus, it is doubtful that the presence of fish hosts is a limiting factor affecting the Higgins' eye pearl mussel (Rasmussen 1979).

A number of aquatic species have been designated as threatened or endangered by the State of Illinois and the State of Iowa. These include four freshwater mussels and three fish species (Table 2-2). The spectaclecase (*Cumberlandia monodonta*) inhabits large rivers with swiftly flowing waters among boulders in patches of sand, cobble, or gravel in areas where current is reduced (Cummings and Mayer 1992). Within Illinois, it is currently restricted to the Mississippi River (Heckert 1992). The butterfly (*Ellipsaria lineolata*) usually inhabits medium to large rivers. It inhabits areas of strong current on coarse sand or gravel bottoms and at water depths from a few inches to four feet (Parmalee 1967). The black sandshell (*Ligumia recta*) is a medium to large river species that occurs in riffles or raceways on firm sand or gravel bottoms at depths of four-to-six feet or more. It is less tolerant of siltation and pollution than many other mussel species (Cummings and Mayer 1992; Heckert 1998; Parmalee 1967). The sheepnose (*Plethobasus cyphus*) inhabits currents of medium to large rivers in gravel or mixed sand and gravel substrates at depths of up to 2 m (6.6 ft) (Cummings and Mayer 1992; Parmalee 1967). Reasons for the decline of these mussel species are similar to those discussed above for the Higgins' eye pearl mussel: dredging, sand and gravel mining, siltation, pollution, and/or zebra mussels (Heckert 1992, 1998).

Several State-listed fish species have been infrequently collected from Pool 14 of the Mississippi River (Bowzer and Lippincott 2000). The lake sturgeon (*Acipenser fulvescens*)

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inhabits the bottoms of lakes and larger rivers that are usually 5 to 9 m (16 to 30 ft) deep over mud, sand or gravel substrates (Page and Burr 1991). Reasons for the decline of the lake sturgeon include impoundments, channelization, pollution, and overfishing (Pflieger 1975; Smith 1979). Within Illinois, the pallid shiner (*Hybopsis amnis*) is confined to the Mississippi and Kankakee rivers. It occurs in pools with negligible current, clear water, and sand-silt substrate. It is apparently intolerant of excessive siltation and turbidity (Herkert 1992). While the pallid shiner is not listed for Iowa in Table 2-2, it was listed as rare by Duyvejonck (1996) and as depleted (not included on Iowa endangered fishes list but meriting special concern) by Menzel (1981). The western sand darter (*Ammocrypta clarum*) inhabits rivers and is restricted to habitats of almost pure sand. It avoids strong currents, preferring the quiet margins of the stream channels and shallow backwaters. It is nocturnal, burying itself in sand during the day. The reason for its decline is probably the result of siltation (Pflieger 1975; Smith 1979).

Several other State-listed fish species have been collected from Pool 14 of the Mississippi River in conjunction with the long-term fisheries monitoring done near the Quad Cities site (Bowzer and Lippincott 2000). These species include: chestnut lamprey (*Ichthyomyzon castaneus*, Iowa threatened), grass pickerel (*Esox americanus*, Iowa threatened), pearl dace (*Margariscus margarita*, Iowa endangered), weed shiner (*Notropis texanus*, Illinois and Iowa endangered), and longnose sucker (*Catostomus catostomus*, Illinois threatened) (IA DNR 2002; IL DNR 1999). There is the potential that some of these records could be misidentifications. For example, within Illinois the longnose sucker is confined to Lake Michigan. Smith (1979) believed that an old record of the longnose sucker from the Rock River was almost certainly based on a misidentified white sucker. In other cases, the Mississippi River is not the primary habitat for the species (e.g., pearl dace and weed shiner) (Page and Burr 1991; Smith 1979).

### 2.2.6 Terrestrial Resources

The Quad Cities site consists of approximately 331 ha (817 ac) of both developed and undeveloped areas. The developed areas mostly occupy the western half of the site. Undeveloped areas are located generally on the eastern half of the site and support habitats that include open fields and planted pines. Approximately 22 ha (55 ac) are leased for farming (i.e., hay). Prior to plant operations, the primary use of the site was agricultural and residential (AEC 1972).

The site is located in an area with sandy soil and little bushy or wooded habitat. The agricultural lands in the vicinity are used for grain and cattle forage crops (AEC 1972). It is expected that a number of the species (i.e., especially terrestrial mammals) inhabiting adjacent areas to the Quad Cities site will also use the limited natural areas within the boundaries of the site. Other local areas with important habitats are the river islands located nearby and the area adjacent to the river in Scott and Clinton counties in Iowa. These areas, which are generally encompassed by the Upper Mississippi River NWFR and the Princeton Wildlife Management Area, provide

upland and bottomland habitats including hardwood forests, grasslands, agricultural fields, islands, wetlands, sloughs, lakes, and shoreline (FWS 2000c). Birds (e.g., migratory passerines, raptors, waterfowl, shorebirds) use the area extensively. The wetlands, forests, and prairies are used by more than 50 species of mammals that include deer, raccoon, muskrat, red and gray fox, coyote, weasel, mink, badger, skunk, river otter, and many other small mammals (FWS 2000c; AEC 1972).

The Princeton Wildlife Management Area is a 482 ha (1190 ac) habitat management unit within the Upper Mississippi River NWFR constructed to provide optimum habitat conditions for fish and wildlife species. The water levels within these units are managed to provide emergent vegetation and mud/sand flats to maintain diverse habitat types for many wetland-dependent species (FWS 2000c). Flood plain forest habitats dominate this management area and include species such as silver maples, green ash, and cottonwoods. Large numbers of bald eagles use this area during the winter months, in addition to waterfowl and migratory passerines (IBB 2002).

A total of five transmission lines (Table 2-1 and Figure 2-5) connect Quad Cities Units 1 and 2 to the electric grid (Exelon 2003a; AEC 1972). These lines occupy 880 ha (2200 ac) of land along 185 km (115 mi) of right-of-way (ROW) that traverses mainly agricultural land along with some natural terrestrial habitats (Exelon 2003a; AEC 1972). Approximately 90 to 95 percent of the transmission corridor can be classified as agricultural. The transmission lines include the Davenport line (Line 0401), the Barstow line (Line 0402), the south Nelson line (Line 0403), the north Nelson line (Line 0404), and the Rock Creek line (Line 0405).

The Davenport transmission line runs 20.6 km (12.8 mi) with a ROW of 55 m (180 ft). It crosses the Mississippi River and the Upper Mississippi River NWFR immediately south of the Quad Cities site as it runs from Illinois into Iowa. The portion of the Upper Mississippi River NWFR traversed by the Davenport corridor is within the Princeton Wildlife Management Area. This area is managed by the IDNR under a cooperative agreement with the Savanna District of the Upper Mississippi River NWFR; the portion of the Davenport corridor crossing this area is just slightly more than 1.6 km (1 mi) in length. All ROW maintenance activities for this transmission line that occur in the refuge must be reviewed and approved by the FWS through the Savanna District Office of the Upper Mississippi River NWFR. The transmission line then crosses predominantly agricultural land with an exception of a short passage (less than 0.8 km [less than 0.5 mi]) through dense timber and one crossing of a lesser distance through sparse timber.

Although the Davenport transmission line crosses agricultural lands for the remainder of its run, it also transverses several small creeks and their tributaries (e.g., Lost Creek, Hickory Creek, and Duck Creek tributaries) (Exelon 2003a; FWS 2000c; AEC 1972).

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The Barstow transmission line runs 28.1 km (17.5 mi), sharing the initial 3.2 km (2 mi) of the corridor with the south Nelson line. The initial 3.2 km (2 mi) has a ROW of 158 m (520 ft), with the remainder a ROW of 44 m (145 ft). The Barstow line passes through agricultural lands (i.e., row crops and pasture) throughout its entire corridor that are typical of eastern Iowa and northwestern Illinois. The Barstow line also crosses Zuma Creek and its tributaries several times along its run (Exelon 2003a; AEC 1972).

The corridor for the south Nelson transmission line runs 67.4 km (41.9 mi) with a ROW of 158 m (520 ft) for the first 3.2 km (2 mi), followed by a 44-m (145-ft) ROW. The north Nelson corridor runs for 63.9 km (39.7 mi) with a 44-m (145-ft) ROW. The terrain traversed by these lines is mostly flat farmland. Both lines cross the Rock River and several small creeks (e.g., Rock Creek, Deer Creek, or Lynn Creek). Both Nelson transmission lines terminate at the Nelson Transmission substation approximately 64 km (40 mi) due east of Quad Cities (AEC 1972).

The Rock Creek transmission line runs through the industrial park just north of Quad Cities Station and then crosses the river into Iowa. This line has a ROW of 52 m (170 ft) and is 8 km (5 mi) long (Exelon 2003a). Its corridor crosses the Mississippi River and the Savanna District of the Upper Mississippi River NWFR approximately 3 km (2 mi) north of the site<sup>(a)</sup> (Exelon 2003a). The Savanna District extends along both sides of the Mississippi River and covers three navigational pools, including Pool 14 where the Quad Cities site is located. The Rock Creek transmission line crosses only open water and riparian habitats within the Upper Mississippi River NWFR.<sup>(b)</sup> All ROW maintenance activities for this transmission line that occur in the refuge must be reviewed and approved by the FWS through the Savanna District Office of the Upper Mississippi River NWFR.

With the exception of the Upper Mississippi River NWFR and the Princeton Wildlife Management Area, the Quad Cities transmission lines traverse lands cultivated for row crops and pasture that are typical of eastern Iowa and northwestern Illinois. The Quad Cities transmission lines do not cross any State or Federal parks — other than the aforementioned refuge and wildlife management area — wildlife refuges or wildlife management areas (Exelon 2003a).

The transmission corridors are maintained by mowing (Cunningham 2003; Exelon 2003d), trimming, tree removal, and by the use of approved herbicides (Exelon 2003a; Exelon 2003d; Exelon 2003e; Cunningham 2003). Unless otherwise noted, vegetation management follows a

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(a) Personal communication with Ed Britton, District Manager, Savanna District, Upper Mississippi National Wildlife and Fish Refuge, May 8, 2003.

(b) Personal communication with Ed Britton, District Manager, Savanna District, Upper Mississippi National Wildlife and Fish Refuge, May 8, 2003.



three-year cycle within the Davenport and Barstow corridors (Exelon 2003d), a five-year cycle within both Nelson corridors (Cunningham 2003), and a six-year cycle within the Rock Creek corridor (Exelon 2003e). Herbicide application is performed according to label specifications by certified applicators. Pre-activity surveys are carried out along the Nelson corridors, although not along the other three transmission line corridors (Cunningham 2003). Training is provided to line maintenance staff in identifying Federally and State listed species — and the species' habitats — that may occur in the vicinity of both Nelson lines and the Rock Creek line, as well as steps to take if one of these species is encountered while carrying out maintenance activities (Cunningham 2003; Exelon 2003e).

Table 2-3 presents terrestrial species that are listed, proposed for listing, or candidates for listing by the Federal government or the States of Iowa and Illinois. State or Federally listed species that could occur in the vicinity of the Quad Cities site include three plants, one reptile, one bird, one mollusk, and two mammals. Of these species, six are Federally protected under the Endangered Species Act (ESA). They are the Indiana bat (*Myotis sodalis*; endangered), Iowa Pleistocene snail (*Discus macclintocki*; endangered), bald eagle (*Haliaeetus leucocephalus*; threatened), western prairie fringed orchid (*Platanthera praeclara*; threatened), eastern prairie fringed orchid (*Platanthera leucophaea*; threatened) and the prairie-bush clover (*Lespedeza leptostachya*; threatened). No designated critical habitat exists for any of the listed species on or in the vicinity of Quad Cities Station. No terrestrial species in the area are proposed for listing or are candidates for listing.

The Indiana bat was originally listed in 1967 as Federally endangered. Its decline is largely attributed to cave destruction and disturbance (FWS 1991b). The Indiana bat is very small, with a wingspan of 23 to 28 cm (9 to 11 in.) and weighing approximately 9 g (0.3 ounces) (FWS 2003c). In winter, the Indiana bat uses limestone caves or abandoned mines for hibernation, although some hibernate under bridges, in old buildings, or under loose bark and in hollows of trees (Nelson 2003; FWS 1991b). This species forages for insects along stream corridors, within the canopy of flood plain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fence rows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age, and sex and ranges up to 33 ha (81 ac) (Nelson 2003). Roosting and rearing of young usually occurs in caves, although it may occur in the loose bark of trees (FWS 1991b). Exelon has not noted any Indiana bats in the vicinity of the Quad Cities site or its associated transmission lines. Undeveloped portions of the Quad Cities site have not been surveyed for the Indiana bat.<sup>(a)</sup> The FWS notes that the bat may occur in all counties in Iowa south of Interstate 80 (Nelson 2003). Interstate 80 is a major east-west highway in Illinois and Iowa approximately 5 miles south of the Quad Cities site. The Iowa Department of Natural

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(a) Personal communication with Ed Cunningham during Quad Cities site audit, March 12, 2003.

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Resources did not note any occurrences of threatened or endangered species in the vicinity of the transmission lines associated with Quad Cities (Brandrup 2002).

**Table 2-3. Terrestrial Species Listed as Endangered or Threatened or Candidates for Listing by the FWS or the States of Illinois and Iowa That Occur or Potentially Occur Within Rock Island, Whiteside, and Lee Counties, Illinois, and Clinton and Scott Counties, Iowa**

Scientific Name	Common Name	Federal Status	Illinois Status	Iowa Status
<b>Mammals</b>				
<i>Myotis sodalis</i>	Indiana bat	E	E	—
<i>Lutra canadensis</i>	river otter	—	T	—
<b>Birds</b>				
<i>Haliaeetus leucocephalus</i>	bald eagle	T	T	—
<b>Mollusks</b>				
<i>Discus macclintocki</i>	Iowa Pleistocene snail	E	E	—
<b>Reptiles</b>				
<i>Heterodon nasicus</i>	western hognose snake	—	T	—
<b>Plants</b>				
<i>Platanthera praeclara</i>	western prairie fringed orchid	T	—	—
<i>Platanthera leucophaea</i>	eastern prairie fringed orchid	T	E	—
<i>Lespedeza leptostachya</i>	prairie bush-clover	T	E	—
T = Threatened; E = Endangered.				
— = Not listed or not afforded protection				
Sources: FWS (1999a, 1999b, 2002); Brandrup (2002); Pietruszka (2002); Nelson (2003); IL DNR (1999); Herkert (1992, 2002).				

The Federally endangered Iowa Pleistocene snail was originally listed in July 1978 (43 FR 28932 [FWS 1978]). This small land snail inhabits algific (i.e., cold producing) talus slopes, within the leaf litter of cool and moist hillsides (Nelson 2003; FWS 2002). It breeds from late March to August by laying two-to-six eggs in this leaf litter, with the eggs hatching approximately 28 days later. The snail feeds on fallen leaves of birch and maple trees or dogwood shrubs. Climate change is attributed as the primary cause of long-term decline of this snail although the most immediate threats are from habitat degradation and destruction, human disturbance, and livestock grazing, as well as misapplication of pesticides (FWS 1997; FWS 2002). The snail has been found in approximately 30 sites in Iowa and Illinois (FWS 2002) with

none noted by Exelon at Quad Cities (Exelon 2003a). Suitable habitat is unlikely to occur at the site or in the immediate vicinity of Quad Cities transmission lines and their corridors, with the majority of traversed land characterized as flat and agricultural (Exelon 2003a).

The bald eagle was originally listed as endangered by the FWS in 1978, but population increases prompted downlisting to threatened status in 1995, and the species is currently proposed for delisting (64 FR 36453 [FWS 1999c]). The bald eagle is a common visitor to the Upper Mississippi River Valley, within which the Savanna District of the Upper Mississippi River NWFR is located and the Quad Cities site is adjacent. The bald eagle uses this area as a winter migration corridor and for summer nesting habitat. During the October to March timeframe, hundreds of bald eagles congregate in the area to feed on fish, typically near lock and dams or in ice-free backwater areas (FWS 2000c). These attractive winter feeding grounds include open water areas created by the warm water effluents from the power plant (Nelson 2003). The Savanna District also documents nesting activity, usually on islands or along backwater shorelines (FWS 2000c). Bald eagles build their nests in large trees near rivers or lakes and often use the same nest year after year. The Savanna district notes that presently there are seven active bald eagle nesting territories and some of these nests have been known to successfully produce young (FWS 2000c). The nearest known bald eagle nest to the Quad Cities site is located at RM 514.3 on Beaver Island and has been established for over a decade with observed success in producing young. This nest is approximately 8 RM (7 mi, 11.3 km) north of the Quad Cities site and 5 RM (4.5 mi, 7.2 km) north of the Rock Creek transmission line. No other known bald eagle nests occur in the vicinity of the Quad Cities site or its associated transmission lines.<sup>(a)</sup>

The Federally threatened western prairie fringed orchid was listed as threatened in 1989, along with the eastern prairie fringed orchid (54 FR 39857 [FWS 1989]). It occurs in mesic to wet tallgrass prairies and meadows, but is also found in old fields or roadside ditches (FWS 1996; FWS 2003c). The western prairie fringed orchid is restricted to areas west of the Mississippi River and is known to occur in about 75 sites in 8 states (FWS 2003a). The prairie fringed orchids are mostly threatened by conversion of its habitats to cropland other habitat loss activities. Other threats include invasive species competition, wetland destruction, intensive hay mowing, fire suppression, and overgrazing (FWS 2003c; Herkert 2002). Based on the known distribution of the species, it is unlikely to be found at the Quad Cities site, but it could be found along the Davenport and Rock Creek transmission lines.

The eastern prairie fringed orchid also occupies mesic to wet tallgrass prairie or grassland habitats (Herkert 2002; FWS 2003c; Nelson 2003). However, it can also occupy bogs, fens, and sedge meadows (FWS 2003c). This species formerly occurred throughout Illinois yet has

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(a) Personal communication with D. Dee, Field Staff, Savanna District, Upper Mississippi River NWFR, September 23, 2003.

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been nearly eliminated from all but northeastern Illinois. There are 30 known Illinois populations; no known populations occur in Whiteside County, although it could occur in Rock Island or Lee counties (records for these counties are no longer extant [Herkert 2002]). No occurrences of either species (eastern or western prairie fringed orchid) have been documented for the Quad Cities site or in areas along its associated transmission lines (Exelon 2003a). Neither the undeveloped portions of the Quad Cities site nor the transmission corridors have been surveyed for these species.<sup>(a)</sup>

The Federally threatened (52 FR 781 [FWS 1987]) prairie-bush clover occurs on dry gravel and sand prairies (Herkert 2002). It is found only in the tallgrass prairie region of four Midwestern states and is currently found at fewer than 40 sites in 23 counties of Iowa, Illinois, Minnesota, and Wisconsin (FWS 2003c), although it could occur throughout Illinois (Nelson 2003). Fourteen known populations occur in Illinois at present with five of these populations protected on public land; none of these known populations occur in Rock Island or Whiteside counties, although a recent record of a population is known for Lee County (Herkert 2002). Undeveloped portions of the Quad Cities site have not been surveyed for the prairie bush-clover.<sup>(a)</sup> The decline of the prairie bush-clover is primarily due to the historic loss of tallgrass prairie habitat from conversion to agricultural land, and this species tends to only occur presently in areas that escaped plowing due to being too rocky or steep (FWS 2003c).

Two species, the river otter and the western hognose snake, are listed as threatened by the Illinois Department of Natural Resources (IL DNR 1999). The river otter uses habitats that include streams, rivers, lakes, ponds, drainage ditches, and backwater areas. It is active during the day and at night and feeds on fish, frogs, and crayfish (IL DNR 1999). The Savanna District of the Upper Mississippi River NWFR notes that river otters do occur in the vicinity of Quad Cities and its associated transmission lines (FWS 2000c; Pietruszka 2002).<sup>(b)</sup> The river otter is increasing in population due to the success of a reintroduction project carried out by the Iowa Department of Natural Resources, and the first legal harvest in many years may occur in 2005.<sup>(b)</sup>

The western hognose snake could occur on or in the vicinity of the Quad Cities site and its associated transmission lines (IL DNR undated). This snake is recorded in sandy areas in the northwestern and west-central parts of Illinois, with a preference for dry, sandy prairie areas (Herkert 1992). The primary cause for its decline is habitat destruction. This species is known to occur in Whiteside, Rock Island, and Lee counties, with recent documented occurrences (Herkert 1992). The Savanna District of the Upper Mississippi River NWFR notes the snake does occur in the district's area (FWS 2000c) and the IDNR has documented an occurrence of

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(a) Personal communication with Ed Cunningham during the Quad Cities site audit, March 12, 2003.

(b) Personal communication with Ed Britton, District Manager, Savanna District, Upper Mississippi National Wildlife and Fish Refuge, May 8, 2003.

this snake in the vicinity of the Quad Cities site in 1977 (Pietruszka 2002). Undeveloped portions of the Quad Cities site have not been surveyed for the western hognose snake.<sup>(a)</sup>

### 2.2.7 Radiological Impacts

Exelon has conducted a radiological environmental monitoring program (REMP) around the Quad Cities site since 1968 (AEC 1972). Through this program, radiological impacts to workers, the public, and the environment are monitored, documented, and compared to the appropriate standards. The objectives of the REMP are:

- Provide representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of members of the public resulting from the station operation.
- Verify that the measurable concentrations or radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways.

Radiological releases are summarized in the annual reports titled, *The Quad Cities Nuclear Power Station 2001 Annual Radiological Environmental Operating Report* (Exelon 2002b) and, *Quad Cities Nuclear Power Station's Radioactive Effluent Report for January through December 2001* (Exelon 2002c). The limits for all radiological releases are specified in the Quad Cities ODCM, and these limits are designed to meet Federal standards and requirements (Exelon 2002a). The REMP includes monitoring of the aquatic environment (fish, invertebrates, and shoreline sediment), atmospheric environment (airborne radiiodine, gross beta and gamma), terrestrial environment (vegetation), and direct radiation (Exelon 2002a).

A review of the historical data on releases and the resultant dose calculations revealed that the doses to maximally exposed individuals in the vicinity of Quad Cities were a small fraction of the limits specified in the EPA's environmental radiation standards in 40 CFR Part 190, as required by 10 CFR 20.1301(d). For 2001 (the most recent year for which data were available), the total effective dose equivalent (TEDE) due to licensed activities at the Quad Cities site calculated for the maximally exposed individual for the year 2001 was 0.069 mSv (6.9 mrem). Most of this dose is due to the direct radiation from Units 1 and 2 (0.064 mSv [6.4 mrem]). The balance of the calculated dose, (0.0059 mSv [0.59 mrem]), is attributable to radiological effluent releases (Exelon 2002b). Calculations were performed using the plant effluent-release data, onsite meteorological data, and appropriate pathways identified in the ODCM.

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(a) Personal communication with Ed Cunningham during the Quad Cities site audit, March 12, 2003.

## **2.2.8 Socioeconomic Factors**

The staff reviewed the applicant's ER (Exelon, 2003a), the Updated Final Safety Analysis Report (UFSAR) (Exelon, 2003c), information from the US Bureau of the Census, and information obtained from several county, city, and economic development staff during a site visit to the Quad Cities vicinity from March 11 to March 13, 2003. The following information describes the economy, population, and communities in the region of Quad Cities.

### **2.2.8.1 Housing**

Exelon employs approximately 1000 workers at Quad Cities Units 1 and 2, with about 850 being permanent employees. Approximately 54 percent of these employees live in Rock Island and Whiteside counties, and 23 percent live in Scott County. The remaining 23 percent of the employees reside in 16 other counties in both Illinois and Iowa.

Given the predominance of Quad Cities employees living in Rock Island, Whiteside, and Scott counties and the absence of likely significant socioeconomic effects in other, more distant locations, the focus of the analyses undertaken in this SEIS is on these three counties (Exelon 2003a).

Exelon refuels Quad Cities Units 1 and 2 on a 24-month cycle. During these refueling outages, site employment increases by approximately 1100 temporary workers for 20 days. Most of these temporary workers are assumed to be located in the same geographic areas as permanent Exelon staff.

Table 2-4 shows the number of housing units and vacancies in the Quad Cities vicinity for 1990 and 2000. These data show a reasonable consistency among the various geographic units in vacancy rates for 1990 and 2000. The pattern mirrors the growth in population, shown in Table 2-6. Homeowner and rental vacancy show a general consistency between the two census years for most of the jurisdictions.

Rock Island and Scott counties have developed comprehensive land-use plans that encourage growth within the existing municipalities and infrastructure. Whiteside County does not have a formal land-use plan but uses zoning and use permits as methods of directing growth to areas currently served by infrastructure (Exelon 2003a).

**Table 2-4. Housing Units and Housing Units Vacant (Available) by County During 1990 and 2000**

	1990	2000	Approximate Percentage Change 1990 to 2000
<b>Rock Island County, IL</b>			
Housing Units	63,327	64,489	2
Vacant Units	4010	3777	-6
<b>Whiteside County, IL</b>			
Housing Units	24,000	25,025	4
Vacant Units	1260	1341	6
<b>Scott County, IA</b>			
Housing Units	61,379	65,649	7
Vacant Units	3941	3315	-16
Source: USBC 2000			

### 2.2.8.2 Public Services

- **Water Supply**

At the present time, the water supply systems in all three counties are operating substantially below their maximum capacities. The Quad Cities site pumps groundwater for use as potable water and is not connected to a municipal system (Exelon 2003a). The three counties most affected by current Quad Cities employees, in terms of consumption of domestic water—Rock Island and Whiteside counties in Illinois, and Scott County in Iowa—are served by a variety of small- to medium-sized water companies and by domestic water wells in the unincorporated areas of the three counties. The current maximum capacity of the major suppliers in each county exceeds the average daily demand by a factor of from 1.7 to 2.9 and averages 2.3 times demand for all three counties (Exelon 2003a).

- **Education**

In 2002, approximately 62,000 students attended schools in Rock Island, Whiteside and Scott counties. Although the region's school districts do not keep track of Quad Cities employees' children, Table 2-5 shows the total enrollment for students in the Quad Cities vicinity.

**Table 2-5. School District Enrollment in Counties with Significant Numbers of Quad Cities Employees**

County	Enrollment
Scott, IA	27,130
Rock Island, IL	24,519
Whiteside, IL	10,367
Total	62,016

Source: National Center for Educational Statistics, 2003

- **Transportation**

Route 84 provides road access to the Quad Cities site. Route 84 is a two-lane paved road oriented in a generally north-south direction along the eastern bank of the Mississippi River. Route 84 intersects with Interstate 80, the major east-west route in the region, approximately 23 km (14 mi) south of the Quad Cities site. Interstate 88 branches east from Interstate 74 about 16 km (10 mi) south of the Quad Cities site. Illinois State Route 74 turns west just north of its intersection with Illinois State Route 88, and it becomes Interstate 80, providing access to Des Moines and other points west. The Quad Cities vicinity is served by an international airport and river barge traffic, in addition to the active trucking activity that makes use of the interstate freeway (Exelon 2003a).

Route 84 is used by employees traveling from the Quad Cities vicinity, from other points south of the site in Rock Island County, and from Whiteside County north of the site. Scott County employees travel across the Interstate 80 bridge and then north on Route 84, along with other employees traveling from Rock Island County to the site. Employees coming from Whiteside County travel south on Route 84 to reach the site (Exelon 2003a).

### 2.2.8.3 Offsite Land Use

Rock Island County is predominately rural, consisting of farmland and woods. The county's population in 2000 was 149,374. The county contains 1170 km<sup>2</sup> (452 mi<sup>2</sup>) or 117,000 ha (289,000 ac) of land/water area. Land use patterns in the county reflect the key importance of livestock production and agriculture to the area. Current land cover in the county by category is: cropland (37.3 percent), grassland (30.2 percent), forest/woodland (12.6 percent), wetland (4.6 percent), urban/built-up (8.1 percent), open water (7.0 percent), and barren/exposed land (0.2 percent) (IL DNR 1996). Agriculture is also a significant land use in nearby Scott and Whiteside counties, representing 77 percent and 88 percent of land area, respectively (USDA 1997).



Annual property taxes from Quad Cities Units 1 and 2 accounted for approximately 2.7 percent of Rock Island County's total levee extension and approximately 2.8 percent of the county's total collections available for distribution for the years 1997 to 2000. The local Cordova taxing districts for the township, library, school district, road and bridge district, and fire department all derive significant revenue from the plant (Rock Island County Board of Review 2002). Negotiations are underway with Rock Island County for a graduated reduction in payments to minimize the financial disruption to county and local operations caused by a change in the Rock Island County methods of plant value assessment due to the deregulation of the utility industry in the State of Illinois (Exelon 2003a).

Rock Island County utilizes four major tools in an effort to manage current and future land use: County Land Use Plan, County Zoning Ordinance, County Land Evaluation and Assessment Program, and County Subdivision Resolution. The county had a population increase of 0.4 percent during 1990 and 2000 after having experienced a 10.4 percent decline in population between 1980 and 1990 (Exelon 2003a). Strong farmland preservation policies in Rock Island and Scott counties dictate that settlement will occur mainly in existing municipalities rather than in rural unincorporated areas (Bi-State Regional Commission 2002). Whiteside County uses a combination of zoning ordinance and use permits to guide county development.

The Quad Cities Metropolitan Statistical Area, consisting of the cities of Davenport and Bettendorf, Iowa, and Rock Island, Moline and East Moline, Illinois, is located about 32 km (20 mi) southwest of the site with a combined population in 2000 of 359,062; an increase of 8201 from 1990 (Bi-State Regional Commission 2002). The nearest town, situated approximately 6 km (4 mi) south from the site, is the village of Cordova, Illinois, with 623 residents in 2000. The nearest population center is the city of Clinton, Iowa, which is approximately 11 km (7 mi) northeast from the site (AEC 1972).

The area immediately surrounding the site is predominantly rural, consisting of farmland and woods; however, there is an industrial park approximately 1.6 km (1 mi) north from the site. A gas-fired, 500-megawatt generating plant (Cordova Energy Center) is located approximately 1.6 km (1 mi) southeast from the site and a 235-megawatt coal-fired electrical generating station (M.L. Kapp) is located 4 km (2 mi) north from the site (Exelon 2003a). Rock Island, Scott, and Whiteside counties are actively seeking to attract and to assist in the development of industrial parks to foster economic growth and promote job creation.

#### **2.2.8.4 Visual Aesthetics and Noise**

The lands surrounding the Quad Cities site are largely agricultural, with an industrial park directly north from the site and a gas-fired power plant southeast from the site. The major buildings are metal-sheathed structures with the metal panels covered in subdued tones. The highest portions of the major buildings, the stack, and the transmission lines are clearly visible

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from Illinois Route 84 and the Mississippi River. Much of the view of the station is obstructed by a grove of evergreen trees along the highway. The transmission line towers used on the site are four-legged open-steel structures. The river crossing towers are painted red and white to increase their visibility for safety purposes (AEC 1972).

The noise from most equipment is confined within the plant buildings, yielding boundary noise at the ambient level (AEC 1972). Testing of on-site and off-site warning sirens occurs monthly.

### 2.2.8.5 Demography

All or parts of 21 counties are located within 80 km (50 mi) of Quad Cities (Figure 2-2). Of these counties, 13 are in Illinois, and 8 are in Iowa. Between 1990 and 2000, the area's population grew 2.3 percent to 359,062, well below the growth of the State of Iowa (5.4 percent), Illinois (8.6 percent), the Midwest (7.9 percent), and the nation (13.2 percent) in the same decade.

According to U.S. Bureau of the Census (USBC) 2000 information, at least 281,423 people live within 32 km (20 mi) of Quad Cities (Exelon 2003a). Applying the GEIS sparseness measures, Quad Cities has a population density of 86 persons/km<sup>2</sup> (224 persons/mi<sup>2</sup>) within 32 km (20 mi) and falls into the least-sparse category, Category 4 (having greater than or equal to 46 persons/km<sup>2</sup> [120 persons/mi<sup>2</sup>] within 32 km [20 mi]). As estimated from USBC 2000 information, at least 656,527 people live within 80 km (50 mi) of Quad Cities (Exelon 2003a). This equates to a population density of 32 persons/km<sup>2</sup> (83 persons/mi<sup>2</sup>) within 80 km (50 mi), which is classified as Category 2 (no city with 100,000 or more persons and between 50 and 190 persons per square mile within 80 km [50 mi]). Applying the GEIS sparseness and proximity matrix, Quad Cities is classified as sparseness Category 4 and proximity Category 2, resulting in the conclusion that Quad Cities is located in a medium-population area.

There are no known Native American lands or reservations within 80 km (50 mi) of the Quad Cities site.

Table 2-6 shows estimated population numbers for the three counties where the majority of the Quad Cities site employees have lived from 1980 and are expected to live through 2030. By the year 2030, the populations of Rock Island and Whiteside counties are projected to decrease at average annual rates of 0.2 percent, in contrast to the growth rate of 0.5 percent projected for the State of Illinois during the same period. The population of Scott County is expected to increase at an average annual rate of 0.4 percent, while Iowa is projected to have an annual average growth rate of 0.1 percent and rise to 3 million people (Exelon 2003a).

**Table 2-6. Regional Demographics**

<b>Estimated Populations and Average Annual Growth Rates in Rock Island and Whiteside Counties, Illinois, and Scott County, Iowa from 1980 to 2030</b>						
<b>Year</b>	<b>Rock Island County</b>		<b>Whiteside County</b>		<b>Scott County</b>	
	<b>Population</b>	<b>Percent</b>	<b>Population</b>	<b>Percent</b>	<b>Population</b>	<b>Percent</b>
1980	165968	-0.1	65970	0.5	160022	1.2
1990	148723	-1	60186	-0.9	150979	-0.6
2000	149374	0.4	60653	0.1	158668	0.5
2010	150990	0.1	58773	-0.3	171960	0.8
2020	149574	-0.1	57987	-0.1	171283	0
2030	142219	-0.5	56517	-0.3	179740	0.5

Source: Exelon 2003a.

Exelon uses Census 2000 data from the U.S. Bureau of the Census to describe general demographic characteristics in the Quad Cities vicinity and for the minority portion of the environmental justice calculations. Exelon used Census 1990 data for the low-income portion of the environmental justice calculations (Exelon 2003a). The discussion of demography in this section and environmental justice in Section 4.4.6 relies on Census 2000 data, which now includes both population and economic data (Geolytics Software 2000).

- **Resident Population Within 80 km (50 mi)**

Table 2-7 presents the population distribution within 80 km (50 mi) of Quad Cities for the year 2000.

**Table 2-7. Population Distribution in 2000 Within 80 km (50 mi) of Quad Cities**

<b>0 to 16 km (0 to 10 mi)</b>	<b>16 to 32 km (10 to 20 mi)</b>	<b>32 to 48 km (20 to 30 mi)</b>	<b>48 to 64 km (30 to 40 mi)</b>	<b>64 to 80 km (40 to 50 mi)</b>	<b>Total</b>
29906	253556	139946	99163	131938	654509

Source: Geolytics Software 2000.

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- **Transient Population**

There is little transient population, either for recreation or for agriculture, in the vicinity of Quad Cities. Almost all of the laborers on farms in the area are believed to be residents in the area. Seasonal migrant labor plays little or no role in field agriculture in the region.

- **Agricultural Labor**

Agriculture contributes significantly to the Quad Cities and surrounding regional economy. Principal crops in the region include corn, soybeans, and hay. According to the U.S. Department of Agriculture's 1997 Census of Agriculture, receipts from all agricultural products totaled \$49.8 million in Rock Island County and \$157.0 million in Whiteside County in 1997. For the State of Illinois, the total from agricultural products was \$8.6 billion. Receipts from agricultural products in Scott County totaled \$95.1 million. Iowa's total from agricultural products was \$11.9 billion (USDA 1997).

### **2.2.8.6 Economy**

The Quad Cities region has a transportation network of trucking and rail terminals, interstate highway access to east-west and north-south routes, one international and a number of regional airports, and access to international seaports via the Mississippi River, giving the area access to both domestic and international markets (Exelon 2003a). The unemployment rates are similar among all the jurisdictions, ranging from just below 3 percent for Iowa to just over 4 percent for Rock Island County. Median household income varies from \$38,600 for Rock Island County to \$42,700 in Scott County, compared with \$40,600 for the Quad Cities Metropolitan Statistical Area, \$39,500 for Iowa, nearly \$47,000 for Illinois, and nearly \$42,000 for the nation (USBC 2000).

A recession in the 1980s and the accompanying farm crisis affected both the agricultural and traditional heavy manufacturing sectors of the economy. While the area is still recovering from this period, a shift has occurred from an economy that was dominated by agriculture to one that is now centered on services, including the gaming industry.

From 1980 to 1996, the nonprofessional employment service sector in Rock Island County increased by 121 percent, manufacturing declined by 41 percent, durable goods employment declined by 54 percent, and non-electrical machine production declined by 63 percent. By 1997, the leading economic employment sectors were services (32 percent), retail trade (22 percent), and manufacturing (19 percent) (Exelon 2003a).

In 1997, the leading economic employment sectors in Whiteside County were manufacturing (36 percent), services (28 percent), and retail trade (20 percent). In Scott County for that same

year, the leading sectors were services (34 percent), retail trade (24 percent), and manufacturing (19 percent) (Exelon 2003a). Table 2-8 lists the largest companies in terms of employment in the Illinois-Iowa Quad Cities vicinity.

**Table 2-8. Largest Employers in the Illinois and Iowa Quad Cities Vicinity**

<b>Company</b>	<b>Number of Employees</b>
Deere and Company	7317
Rock Island Arsenal	6000
Genesis Medical Center	3000
ALCOA	2513
Trinity Regional Health	2500
IBP, Inc.	2300
MidAmerica Energy Company	1200
Kraft Foods North America, Inc.	1200
Illini Hospital	950
CNH Global	816
ComEd	800
APAC Customer Service	800
KONE, Inc.	600
Bituminous Casualty Corp	520

Source: Quad Cities Development Group, 2003.

There are a number of large industrial parks in various stages of planning, implementation, and completion in Rock Island, Henry, and Whiteside counties in Illinois and Scott County in Iowa. In recent years, developments along the Mississippi riverfront designed to complement the corporate presence in the area and to attract convention and shopping have been built or are in the process of being built, both in Iowa and Illinois.

In the State of Illinois, sub-county entities, particularly townships, play a major role in local real property tax administration. Each local taxing body examines its fiscal needs and creates a budget, then extends a levee, or proposed claim, to the county in an amount that will cover the portion of its proposed budget that is to be covered by local real property taxes. The county then evaluates the assessed value of the real property in the township and associated taxing bodies with the total levee and develops a tax rate schedule to issue property tax bills to property owners. The county collects the taxes and redistributes them to the local agencies (Exelon 2003a).

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In 1997, the State of Illinois deregulated the electric power utility industry, which, in turn, led to a change in the method used to assess the value of utilities' real property for county tax purposes. Before deregulation, utility real property was assessed on the basis of depreciated book value. Following deregulation, real property was assessed on the basis of fair market value. Because fair market values are influenced by economic conditions and market forces, current fair market values are expected to differ from (and generally be lower than) depreciated book values, with attendant lower overall tax revenues, at current tax rates. Therefore, it is anticipated that Rock Island County's property tax revenues from Quad Cities Units 1 and 2 will most likely be lower than in the past. Table 2-9 lists the amount of Quad Cities tax payments to Rock Island County and collections of available distributions. In addition, Exelon has appealed its 2001 real property assessment and associated tax bill and is negotiating a graduated reduction in payments to minimize the final disruption to the districts caused by a sudden revenue reduction (Exelon 2003a). Exelon is also appealing its 2002 real property assessment and tax bill. The appeal process and any attendant negotiations over assessed value and tax payments are outside the scope of the current SEIS; it is noted that tax revenues from Quad Cities Units 1 and 2 will likely be lower in the future, although how much lower is not known at this time.

**Table 2-9. Quad Cities Contributions to Rock Island County Operating Budgets**

<b>Year</b>	<b>Property Tax Paid by Quad Cities</b>	<b>Percent of Collections Available for Distribution</b>	<b>Rock Island County Collections Available for Distribution to Districts</b>
1997	\$3,241,673	2.8	\$117,630,496
1998	\$3,394,251	2.8	\$122,356,796
1999	\$3,524,299	2.7	\$129,713,348
2000	\$3,607,871	2.7	\$135,791,633

Source: Exelon 2003a.

### 2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known historic and archaeological resources at the Quad Cities site and in the surrounding area.

#### 2.2.9.1 Cultural Background

The region around the Quad Cities site contains numerous prehistoric and historic Native American and Euro-American cultural resources. The applicant's ER mentions 322 properties

listed in the National Register of Historic Places for the four counties near Quad Cities Units 1 and 2 (Exelon 2003a). These registered properties are mostly historic Euro-American places and none are located in areas affected by operation of the Quad Cities site. The region of the United States in the vicinity of the Quad Cities site is rich in prehistoric archaeological remains as well (Fowler and Hall 1978).

“Paleo Indians” occupied North America from 10,000 to 12,000 years ago, living off the land and subsisting on large game that has since become extinct. From approximately 10,000 years ago and lasting until approximately 1 AD, “archaic people” were present in the native oak/hickory deciduous forests of the area where they hunted animals and gathered plants. (State of Illinois 2001). Following the existence of these people came the “Woodland” culture, which archaeologists define as occupying the region between 500 BC and 900 AD. In the Woodland culture, Native Americans became regionally distinct cultural entities. Woodland people were dependent on maize agriculture, lived in villages, practiced a religion manifested by burial mounds, used the bow and arrow in hunting, and began to make pottery (Fowler and Hall 1978).

The “Mississippian” culture followed the Woodland culture from 900 to 1500 AD. This culture is seen as a complex society of people who lived in large fortified villages, built temple mounds, and practiced improved agricultural methods (Fowler and Hall 1978).

Known examples of older prehistoric sites are rare on the banks of the Mississippi River, but Native American archaeological sites that date to the Woodland and Mississippian periods are fairly common. Albany Mounds, a middle Woodland site located just south of the present town of Albany and less than 16 km (10 mi) from the Quad Cities site, is located on the Mississippi River flood plain (Illinois State Museum 2000). Locally, the majority of recorded prehistoric archaeological sites are found either on top of or within terraces of the Mississippi River and its tributaries.

The Native American societies in the project region shared several important characteristics at the time they were first contacted by Europeans. These included an economic base that combined hunting and gathering with growing corn; and an annual settlement cycle that varied between population concentrations into semi-permanent river-side villages in summer, large camps in winter, and population dispersal among scattered camps in the spring and fall (Callender 1978).

The Quad Cities site was on the edge of several tribal territories at the time of historic contact. Territorial boundaries were in flux throughout the historic period and until the mid-Nineteenth Century. By the mid-1600s eastern tribes were displaced to the west and had begun to put pressure on the tribes in the region where Quad Cities is located today. By 1650, the Miami had settled in northwestern Illinois and probably had encompassed the Quad Cities site within their territory. The country of the loosely affiliated Illinois tribes was several tens of kilometers

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to the west and south when Europeans made first note of their existence. In 1673, the Illinois occupied a region that extended from the southern tip of Lake Michigan westward into Iowa and south into Arkansas (Bauxar 1978).

Upon settling near the present day Quad Cities site, the Miami were in conflict with the Sioux, who occupied territories to the north and west, and shortly after 1700 the Miami moved out of the area. By the 1730s, Sauk and Fox peoples occupied the lands abandoned by the Miami. They lived on the banks of the Mississippi River as far south as the mouth of the Rock River. In just 10 years, they left the area (Bauxar 1978).

The Sauk and Fox were back in the vicinity of Quad Cities by the late 1700s. After defeat by the Chippewa in 1783 at their village above the mouth of the Wisconsin River, they withdrew down the Mississippi River, establishing villages on both sides of the river as far south as the mouth of the Des Moines River.

By 1829, under pressure from Euro-American settlement and with the encouragement of the territorial governor, Sauk and Fox leaders moved their villages to the west side of the Mississippi River. The Sauk and Fox continued to make visits to the Illinois side to hunt and gather, but in 1832, U.S. General Henry Atkinson engaged in a campaign against them that defeated the tribes and definitively removed them from the territory east of the Mississippi River.

The Potawatomi are also said to have expanded their territory into the project area in the 1800s (Clifton 1978). The Kickapoo may have passed through the area around 1700 (Tanner 1986). All lands in the region surrounding the Quad Cities site were ceded in treaties dating to the decade of the 1830s. By the 1870s there were no recognized Native American villages near the project area.

Today, there are tribes in Texas, Oklahoma, Kansas, Iowa, Wisconsin, and Michigan who could, because of past association with lands at or near Quad Cities, have an interest in the plans for operation of Quad Cities Units 1 and 2. They include Kickapoo, Sauk and Fox, Iowa, and Potawatami tribal organizations.

### 2.2.9.2 Historic and Archaeological Resources at Quad Cities

The applicant's ER makes no mention of historic architecture, historic landscape, traditional cultural property, or archaeological sites recorded at the Quad Cities site in Illinois (Exelon 2003a). The NRC did conduct historic and archaeological site file searches at repositories in Illinois, where it found a record of an archaeological site at or near Quad Cities. That record dates to 1933 when the University of Chicago documented an archaeological site that contained surface features, which "look remarkably like Indian mounds," in association with



stone tools and pottery. They attributed the archaeological site to the Woodland period and plotted it on land that would eventually be used by Quad Cities.

The original environmental statement related to operation of Quad Cities (AEC 1972) incorrectly concluded that there were no known archaeological remains in the immediate vicinity of the station near Cordova, Illinois. The U.S. Department of Interior commented on the draft environmental statement in late August 1972, by expressing concern over the proposed construction of a spray canal and its potential to affect archaeological resources (USDI 1972). The U.S. Department of Interior recommended that the Atomic Energy Commission should consult with archaeologist Charles Bareis.

By the first week of September 1972, Bareis had written a letter to the Commission noting that on "page 16 of the Environmental Statement, it is stated that there is an absence of archaeological materials at the plant site. This is an error because a check of our records indicates that at least one archaeological site, Ri-60, consisting of five mounds, were or are located in the plant area" (Bareis 1972a).

Within less than three weeks, Bareis again wrote to the Commission to report that he had conducted a reconnaissance survey on a portion of a spray canal then under construction near the Mississippi River (Bareis 1972b). Bareis found no evidence of archaeological materials in the canal right-of-way south of the plant and a few "areas of interest" in the right-of-way north of the plant. Though he felt what he had observed had little likelihood of proving significant, he recommended "use of due caution" during excavation.

### **2.2.10 Related Federal Project Activities and Consultations**

The staff reviewed the possibility that the activities of other Federal agencies might impact the renewal of the Quad Cities OLS. Any such activities could result in cumulative environmental impacts and the possible need for a Federal agency to become a cooperating agency for the preparation of the SEIS.

Quad Cities Units 1 and 2 are located on the east side of Pool 14 of the Mississippi River, a reservoir that was established by the U.S. Army Corps of Engineers and continues to be subject to routine maintenance, such as dredging.

Federal facilities and lands in proximity to the Quad Cities site are the Rock Island Arsenal, Savanna Army Depot, and the Upper Mississippi River NWFR. The Rock Island Arsenal is located 32 km (20 mi) south in the City of Rock Island and the Savanna Army Depot is 48 km (30 mi) north near Hanover, Illinois. The Upper Mississippi River NWFR is located on the Iowa

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side of the Mississippi River, across from the Quad Cities site. It was established in 1924 to protect bottomland habitat and extends 418 km (261 mi) along the west shore of the Mississippi River.

After reviewing the Federal activities in the vicinity of Quad Cities, the staff determined there are no Federal project activities that could result in cumulative impacts or would make it desirable for another Federal agency to become a cooperating agency for preparing this SEIS.

- | The NRC is required under Section 102 of the National Environmental Policy Act (NEPA) to consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved. The NRC consulted with the U.S. Department of the Interior, Fish and Wildlife Service, and the consultation correspondence is included in Appendix E.

## 2.3 References

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10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

40 CFR Part 81. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes."

- | 10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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## 3.0 Environmental Impacts of Refurbishment

Environmental issues associated with refurbishment activities are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup> The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this supplemental environmental impact statement (SEIS) unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1 and, therefore, additional plant-specific review of these issues is required.

License renewal actions may require refurbishment activities for the extended plant life. These actions may have an impact on the environment that requires evaluation, depending on the type of action and the plant-specific design. Environmental issues associated with refurbishment that were determined to be Category 1 issues are listed in Table 3-1.

Environmental issues related to refurbishment considered in the GEIS for which these conclusions could not be reached for all plants, or for specific classes of plants, are Category 2 issues. These are listed in Table 3-2.

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

Environmental Impacts of Refurbishment

**Table 3-1. Category 1 Issues for Refurbishment Evaluation**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>
<b>SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)</b>	
Impacts of refurbishment on surface water quality	3.4.1
Impacts of refurbishment on surface water use	3.4.1
<b>AQUATIC ECOLOGY (FOR ALL PLANTS)</b>	
Refurbishment	3.5
<b>GROUND-WATER USE AND QUALITY</b>	
Impacts of refurbishment on ground-water use and quality	3.4.2
<b>LAND USE</b>	
Onsite land use	3.2
<b>HUMAN HEALTH</b>	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
<b>SOCIOECONOMICS</b>	
Public services: public safety, social services, and tourism and recreation	3.7.4; 3.7.4.3; 3.7.4.4; 3.7.4.6
Aesthetic impacts (refurbishment)	3.7.8

Category 1 and Category 2 issues related to refurbishment that are not applicable to Quad Cities because they are related to plant design features or site characteristics not found at Quad Cities are listed in Appendix F.

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section, if such actions were planned. Exelon Generation Company, LLC (Exelon) indicated that it has performed its integrated plant assessment, the evaluation of structures and components pursuant to 10 CFR 54.21, to identify activities that are necessary to continue operation of Quad Cities Units 1 and 2 during the requested 20-year period of extended operation. These activities include replacement of certain components as well as new inspection activities and are described in the Environmental Report (Exelon 2003). However, Exelon stated that the replacement of these components and the additional inspection activities are within the bounds of normal plant component replacement and inspections; therefore, they are not expected to affect the environment outside the bounds of plant operations as evaluated in the final environmental statement (AEC 1972). In addition, Exelon's evaluation of structures and components as required by 10 CFR 54.21 did not identify any major plant refurbishment activities or modifications necessary to support the

continued operation of Quad Cities Units 1 and 2 beyond the end of the existing operating licenses. Therefore, refurbishment is not considered in this SEIS.

**Table 3-2. Category 2 Issues for Refurbishment Evaluation**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>	<b>10 CFR 51.53 (c)(3)(ii) Subparagraph</b>
<b>TERRESTRIAL RESOURCES</b>		
Refurbishment impacts	3.6	E
<b>THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)</b>		
Threatened or endangered species	3.9	E
<b>AIR QUALITY</b>		
Air quality during refurbishment (nonattainment and maintenance areas)	3.3	F
<b>SOCIOECONOMICS</b>		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Offsite land use (refurbishment)	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
<b>ENVIRONMENTAL JUSTICE</b>		
Environmental justice	Not addressed <sup>(a)</sup>	Not addressed <sup>(a)</sup>
(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. If a licensee plans to undertake refurbishment activities for license renewal, environmental justice must be addressed in the licensee's environmental report and the staff's environmental impact statement.		

### 3.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

## Environmental Impacts of Refurbishment

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Exelon Generation Company, LLC (Exelon). 2003a. *Applicant's Environmental Report—Operating License Renewal Stage Quad Cities Nuclear Power Station Units 1 and 2, License Nos. DPR-29 and DPR-30*. Warrenville, Illinois.

U.S. Atomic Energy Commission (AEC). 1972. *Final Environmental Statement Related to the Operation of Quad-Cities Nuclear Power Station, Units 1 and 2, Commonwealth Edison Company and the Iowa-Illinois Gas and Electric Company*. Docket Nos. 50-254 and 50-265, Washington, D.C. September 1972.

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## 4.0 Environmental Impacts of Operation

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup> The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to the Quad Cities plant. Section 4.1 addresses issues applicable to the Quad Cities plant cooling system. Section 4.2 addresses issues related to the transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation. Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses potential new and significant information that was identified during the scoping period.

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.



## Environmental Impacts of Operation

Section 4.8 addresses cumulative impacts of operations during the renewal term. The results of the evaluation of environmental issues related to operation during the renewal term are summarized in Section 4.9. Finally, Section 4.10 lists references cited in the chapter. Category 1 and Category 2 issues that are not applicable to Quad Cities because they are related to plant design features or site characteristics not found at Quad Cities are listed in Appendix F.

### 4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B that are applicable to Quad Cities Units 1 and 2 cooling-system operation during the renewal term are listed in Table 4-1. Exelon Generation Company, LLC (Exelon) stated in its Environmental Report (ER) that no new information existed for the issues that would invalidate the GEIS conclusions (Exelon 2003a). The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

**Table 4-1. Category 1 Issues Applicable to the Operation of the Quad Cities Units 1 and 2 Cooling System During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>
<b>SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)</b>	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.4.2
Temperature effects on sediment transport capacity	4.2.1.2.3; 4.4.2.2
Scouring caused by discharged cooling water	4.2.1.2.3; 4.4.2.2
Eutrophication	4.2.1.2.3; 4.4.2.2
Discharge of chlorine or other biocides	4.2.1.2.4; 4.4.2.2
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4; 4.4.2.2
Discharge of other metals in waste water	4.2.1.2.4; 4.4.2.2
Water use conflicts (plants with once-through cooling systems)	4.2.1.3
<b>AQUATIC ECOLOGY (FOR ALL PLANTS)</b>	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.4.3

Table 4-1. (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
Cold shock	4.2.2.1.5; 4.4.3
Thermal plume barrier to migrating fish	4.2.2.1.6; 4.4.3
Distribution of aquatic organisms	4.2.2.1.6; 4.4.3
Premature emergence of aquatic insects	4.2.2.1.7; 4.4.3
Gas supersaturation (gas bubble disease)	4.2.2.1.8; 4.4.3
Low dissolved oxygen in the discharge	4.2.2.1.9; 4.4.3
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10; 4.4.3
Stimulation of nuisance organisms (e.g., shipworms)	4.2.2.1.11; 4.4.3
<b>HUMAN HEALTH</b>	
Microbiological organisms (occupational health)	4.3.6
Noise	4.3.7

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Altered current patterns at intake and discharge structures. Based on information in the GEIS, the Commission found that

Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

- Temperature effects on sediment transport capacity. Based on information in the GEIS, the Commission found that

These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

## Environmental Impacts of Operation

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of temperature effects on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

- Scouring caused by discharged cooling water. Based on information in the GEIS, the Commission found that

*Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.*

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

- Eutrophication. Based on information in the GEIS, the Commission found that

*Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.*

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of Eutrophication during the renewal term beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

*Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.*

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a); the scoping process; the staff's site visit; the staff's evaluation of other available information, including the National Pollutant Discharge Elimination System (NPDES) permit for Quad Cities, Discharge Monitoring Reports (DMRs), and discussion with the NPDES compliance office; and public comments

on the draft SEIS. Therefore, the staff concludes that there are no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

Effects are readily controlled through NPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a); the scoping process; the staff's site visit; the staff's evaluation of other available information, including the NPDES permit for Quad Cities, DMRs, and discussion with the NPDES compliance office; and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

- Discharge of other metals in waste water. Based on information in the GEIS, the Commission found that

These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a); the scoping process; the staff's site visit; the staff's evaluation of other available information, including the National Pollutant Discharge Elimination System (NPDES) permit for Quad Cities, DMRs, and discussion with the NPDES compliance office; and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of discharges of other metals in waste water during the renewal term beyond those discussed in the GEIS.

- Water use conflicts (plants with once-through cooling systems). Based on information in the GEIS, the Commission found that

These conflicts have not been found to be a problem at operating nuclear power plants with once-through heat dissipation systems.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the

## Environmental Impacts of Operation

draft SEIS. Therefore, the staff concludes that there are no impacts of water-use conflicts associated with the once-through cooling system during the renewal term beyond those discussed in the GEIS.

- Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the Commission found that

Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of thermal plume barriers to migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

Thermal discharge may have localized effects but is not expected to effect the larger geographical distribution of aquatic organisms.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on the distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem at Quad Cities and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the

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draft SEIS. Therefore, the staff concludes that there are no impacts of premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- Gas supersaturation (gas bubble disease). Based on information in the GEIS, the Commission found that

Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- Low dissolved oxygen in the discharge. Based on information in the GEIS, the Commission found that

Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses. Based on information in the GEIS, the Commission found that

These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's

site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of losses from predation, parasitism, and disease among organisms exposed to sublethal stresses during the renewal term beyond those discussed in the GEIS.

- Stimulation of nuisance organisms (e.g., shipworms). Based on information in the GEIS, the Commission found that

Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Microbiological organisms (occupational health). Based on information in the GEIS, the Commission found that

Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of microbiological organisms during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the



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draft SEIS. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

The Category 2 issues related to cooling system operation during the renewal term that are applicable to Quad Cities Units 1 and 2 are discussed in the section that follows and are listed in Table 4-2.

**Table 4-2. Category 2 Issues Applicable to the Operation of the Quad Cities Units 1 and 2 Cooling System During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>	<b>10 CFR 51.53(c)(3)(ii) Subparagraph</b>	<b>SEIS Section</b>
<b>AQUATIC ECOLOGY(FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)</b>			
Entrainment of fish and shellfish in early life stages	4.2.2.1.2; 4.4.3	B	4.1.1
Impingement of fish and shellfish	4.2.2.1.3; 4.4.3	B	4.1.2
Heat shock	4.2.2.1.4; 4.4.3	B	4.1.3
<b>HUMAN HEALTH</b>			
Microbiological organisms (public health)(plants using lakes or canals, or cooling towers, or cooling ponds that discharge to a small river)	4.3.6	G	4.1.4

### 4.1.1 Entrainment of Fish and Shellfish In Early Life Stages

For plants with once-through cooling systems, entrainment of fish and shellfish in early life stages into cooling-water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal. To perform this evaluation, the staff reviewed the Quad Cities Units 1 and 2 ER (Exelon 2003a); visited the Quad Cities site; and reviewed the applicant's State of Illinois NPDES Permit IL0005037, issued on May 26, 2000, and in force until May 31, 2005 (IEPA 2000).

Section 316(b) of the Clean Water Act (CWA) requires that any standard established pursuant to Sections 301 or 306 of the CWA shall require that the location, design, construction, and capacity of cooling-water-intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Entrainment of fish and shellfish into the cooling system is a potential adverse environmental impact that can be minimized by the best technology available.

The fish community of Pool 14 has been monitored yearly by the applicant since 1971 to detect any potential impacts of Quad Cities Units 1 and 2 operation. There are no indications that entrainment has had a destabilizing impact on fish populations (Exelon 2003a). Naturally occurring environmental perturbations (e.g., droughts, floods, and severe winters), the modification of the river to accommodate barge navigation, and land use within the watershed have had the greatest influences on fish populations (Section 2.2.5).

In Pool 14, the ichthyoplankton drift typically runs from mid-April through late July. There is minimal to no difference in density between day versus night collections nor in depth within the water column (LaJeone and Monzingo 2000). Freshwater drum dominate the drift, comprising over 80 percent of the eggs and 57 percent of the larvae. Other common species include emerald shiner and common carp. Lesser contributions come from sunfishes, gizzard shad, and buffaloes (LaJeone and Monzingo 2000).

Under a very conservative scenario of total mortality of all entrained ichthyoplankton, projected entrainment losses could be as high as 5.4 percent during the peak periods of the occurrence of fish eggs and larvae in the water column (La Jeone and Monzingo 2000). However, as long as discharge temperatures do not exceed 37.8°C (100°F), some entrainment survival does occur (LaJeone and Monzingo 2000). Lawler Matusky Skelly Engineers (LMS) estimated that with 100 percent entrainment, mortality would impact 0.1 to 0.7 percent of total larvae that pass the plant (LMS 1985). However, after applying entrainment survival data to freshwater drum, common carp, and buffalo species, the entrainment losses of these species were from 0.0006 to 0.10 percent, 0.0000 to 0.0055 percent, and 0.000 to 0.004 percent, respectively. These projections of cropping are not considered to adversely affect the fish community of Pool 14 (LaJeone and Monzingo 2000).

The staff reviewed the available information provided by Exelon in the Quad Cities Units 1 and 2 ER (Exelon 2003a) related to the CWA 316(b) permitting process. Based on the results of past entrainment studies and the operating history of Quad Cities Units 1 and 2's intake structure, the staff concludes that the potential impacts of entrainment of fish and shellfish in the early life stages into the cooling water intake system are SMALL, and further mitigation measures are not warranted.

### **4.1.2 Impingement of Fish and Shellfish**

For plants with once-through cooling systems, impingement of fish and shellfish on debris screens of cooling-water system intakes is considered a Category 2 issue, requiring a site-specific assessment before license renewal. To perform this evaluation, the staff reviewed the Quad Cities Units 1 and 2 ER (Exelon 2003a); visited the Quad Cities site; and reviewed the applicant's State of Illinois NPDES Permit IL0005037, issued on May 26, 2000, and in force until May 31, 2005 (IEPA 2000).

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Section 316(b) of the CWA states that any standard established pursuant to Section 301 or 306 of the CWA requires that the location, design, construction, and capacity of cooling-water-intake structures reflect the best technology available for minimizing adverse environmental impacts (33 USC 1326). Impingement of fish and shellfish on the debris screens of the cooling system is a potential adverse environmental impact that can be minimized by the use of best technology available.

Commonwealth Edison submitted a supplemental CWA Section 316(b) Demonstration in 1981 that evaluated impingement at Quad Cities Units 1 and 2, and concluded that losses due to impingement were minimal. This demonstration was approved by both the Iowa Department of Environmental Quality and the Illinois Environmental Protection Agency (IEPA) in 1981. From 1972 to 1983, the Quad Cities station operated in a closed-cycle or partial closed-cycle mode. Included in an agreement (Open Cycle Agreement 1983) to allow the return of open-cycle operation was a commitment to construct and operate a fish production facility to mitigate potential impingement/entrainment impacts (LaJeone and Monzingo 2000).

The current NPDES permit requires Exelon to monitor fish impingement once weekly. Each year's data are tabulated and compared to historical fish impingement data. The results are submitted to the IEPA. The IEPA then evaluates the impingement data as part of the NPDES renewal process which occurs every five years.

At the low river flow of 453 m<sup>3</sup>/s (16,000 ft<sup>3</sup>/s), mean intake velocity with all pumps operating is about 0.5 m/s (1.5 ft/sec) at the traveling screens. Intake velocity measurements taken at the entrance to the intake forebay averaged less than 0.3 m/s (1.0 ft/sec) at a river flow of 850 m<sup>3</sup>/s (30,000 cfs). At average river flows of 1,530 m<sup>3</sup>/s (54,000 cfs), intake velocities are lower. When ambient river water temperature falls below 4.4°C (40°F) in the late autumn, cooling water requirements for the station can be reduced by one half. This is accomplished by opening the ice-melt recirculation line and by idling one condenser circulating water pump from each unit. During this period, current velocities at the forebay entrance and traveling screens are also reduced by about 50 percent (LaJeone and Monzingo 2000).

Eighty fish species have been identified from impingement samples (Bowzer and Lippincott 2000). Gizzard shad and freshwater drum dominate the impinged species, accounting for 90 percent of the numbers and biomass of all fish impinged. Far lower contributions are made by bluegill, white bass, and channel catfish at 5 percent, 1.9 percent, and 1.7 percent by number, respectively (LaJeone and Monzingo 2000). Generally, impingement increases during the autumn and remains high throughout the winter and spring. The greatest numbers are impinged during the winter months, with fewest during the May to August period. Gizzard shad impingement peaks in January and February, coincident with stresses of freezing or near-freezing water temperatures. Freshwater drum numbers peak in March or April. Impingement is primarily comprised of young-of-year or yearlings (LaJeone and Monzingo 2000). Annual impingement estimates have ranged from 59,000 fish in 1981 to 2,989,000 fish in 1989; with

weight of fish impinged ranging from 1200 kg (2650 lb) in 1981 to 153,700 kg (338,850 lb) in 1989 (Bowzer and Lippincott 2000).

Fish impingement at the Quad Cities site, though relatively high, does not adversely impact the fish community because the vast majority of fish impinged by the site during winter are dead or moribund upon their arrival in the intake forebay (LaJeone and Monzingo 2000). There have been no measurable changes to the fish community of Pool 14 related to the Quad Cities Units 1 and 2, and no indications that impingement has had a destabilizing impact on fish populations (LaJeone and Monzingo 2000). Naturally occurring environmental perturbations (e.g., droughts, floods, and severe winters), the modification of the river to accommodate barge navigation, and land use within the watershed have had the greatest influences on fish populations (Section 2.2.5). Because the Quad Cities site operates as a "base load" facility, there is only minor variation in cooling water usage between years. Therefore, wide annual fluctuations in the numbers of fish impinged are indicative of actual changes in fish abundance in the pool, as well as a measure of seasonal and hydrologic effects on fish survival (Bowzer and Lippincott 2000).

The staff has reviewed the available information. Based on the results of past impingement studies and the operating history of the Quad Cities Units 1 and 2 intake structure, the staff concludes that the potential impacts of impingement of fish and shellfish are SMALL, and further mitigation measures are not warranted.

#### 4.1.3 Heat Shock

For plants with once-through cooling systems, the effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation before license renewal. The NRC made impacts on fish and shellfish resources resulting from heat shock a Category 2 issue because of continuing concerns about thermal-discharge effects and the possible need to modify thermal discharges in the future in response to changing environmental conditions (NRC 1996). Information to be considered includes (1) the type of cooling system (whether once-through or cooling pond) and (2) evidence of a CWA Section 316(a) variance or equivalent State documentation. To perform this evaluation, the staff reviewed the Quad Cities Units 1 and 2 ER (Exelon 2003a); visited the Quad Cities site; and reviewed the applicant's State of Illinois NPDES Permit IL0005037, issued on May 26, 2000, and in force until May 31, 2005 (IEPA 2000).

Quad Cities Units 1 and 2 have a once-through heat dissipation system. Commonwealth Edison submitted a supplemental CWA Section 316(a) Demonstration in 1981 that evaluated thermal discharges at Quad Cities plant. This demonstration was approved by both the Iowa Department of Environmental Quality and the Illinois EPA in 1981 (Exelon 2003a). Quad Cities Units 1 and 2 have been able to operate at full power in the open-cycle mode while still meeting

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State water temperature standards under most river flow conditions. The site utilizes river water at the rate of 61,000 L/s (970,000 gpm) and condenser cooling water is warmed a maximum of 15.6°C (28°F) above ambient before being discharged to the river. Heated condenser water is completely mixed with river water and meets the 2.8°C (5°F) criterion within 152 m (500 ft) downstream of the diffuser pipes (LaJeone and Monzingo 2000). Under low flow conditions, power levels sometimes have to be reduced to ensure that the NPDES permit temperature limits are not exceeded. Under normal circumstances, Quad Cities Units 1 and 2 meet State water quality (temperature) standards. Exelon has consistently operated Quad Cities Units 1 and 2 in compliance with the thermal-discharge limits established for the plant by the IEPA. Therefore, no formal CWA Section 316(a) variance in accordance with 40 CFR 125 has been needed or sought by the facility.

Thermal discharges related to the operation of Quad Cities Units 1 and 2 affect a relatively small area of the Mississippi River. The required thermal mixing zone does not exceed 10.5 ha (26 acres). This is only about 0.25 percent of the area of Pool 14 (4165 ha [10,292 acres]). Furthermore, it extends no more than 152 m (500 ft) downstream of the point of discharge. Section 2.2.5 discusses the major changes and modifications to the Upper Mississippi River that have had an effect on aquatic resources. Thermal discharges have not been implicated as having caused any adverse impacts on fish or shellfish. A major mussel bed, which is one of the Essential Habitat Areas for the endangered clam, the Higgins' eye pearlymussel (*Lampsilis higginsii*), is located at River Miles 505.5 through 503.0 (Section 2.2.5). This mussel bed is over 1.6 km (1.0 mi) downstream of the Quad Cities site and mixing zone. Therefore, this mussel bed is not affected by thermal discharges.

The staff has reviewed the available information, and on the basis of the conditions of the NPDES permit and the operating history of the Quad Cities Units 1 and 2 discharge, concludes that the potential impacts of discharged heated water from the cooling-water-intake system to aquatic biota are SMALL, and further mitigation measures are not warranted.

### 4.1.4 Microbiological Organisms (Public Health)

The effects of microbiological organisms on human health are listed as a Category 2 issue and require plant-specific evaluation before license renewal. The annual flow of the Mississippi River near the Quad Cities site is  $4.5 \times 10^{10} \text{ m}^3$  ( $1.6 \times 10^{12} \text{ ft}^3$ ) per year, which is less than the  $8.9 \times 10^{10} \text{ m}^3$  ( $3.15 \times 10^{12} \text{ ft}^3$ ) per year threshold value in 10 CFR 51.53(c)(3)(ii)(G). Thus, the effects of its discharge on microbiological organisms must be addressed for Quad Cities Units 1 and 2.

The Category 2 designation is based on the magnitude of the potential public-health impacts associated with thermal enhancement of the enteric pathogens (*Salmonella* sp. and *Shigella* sp.), the *Pseudomonas aeruginosa* bacterium, thermophilic fungi, a number of

*Legionella* sp. bacteria species, and pathogenic strains of the free-living amoebae (*Naegleria fowleri* and *Acanthamoeba* sp.) (NRC 1999). Generally, Quad Cities Units 1 and 2 discharge temperatures do not exceed 44.2 °C (111.6 °F). In July and August, 2001, daily temperatures in the discharge canal ranged from 32.1 to 43.3 °C (89.7 to 110°F) and below those known to be conducive to the growth and survival of thermophilic pathogens (Exelon 2003a). Based on these average daily temperatures in the discharge canal, coupled with the dilution provided by the Mississippi River, the thermophilic microorganisms are not expected to cause any appreciable public health risk (Mudgett 2002). The State of Iowa Department of Public Health also concurs that there is no significant threat to the public from thermophilic microorganisms attributable to operation of Quad Cities Unit 1 and 2 (Barton 2002). Disinfection of the Quad Cities Units 1 and 2 sewage treatment plant effluent and NPDES permit requirements to monitor fecal coliforms in this effluent further reduces the potential for the heated discharge to be a seed source or inoculant for pathogenic microorganisms (Exelon 2003a).

The staff independently reviewed the Quad Cities Units 1 and 2 ER (Exelon 2003a); visited the Quad Cities site; and reviewed the applicant's State of Illinois NPDES Permit IL0005037, issued on May 26, 2000, and effective until May 31, 2005 (IEPA 2000). Based on its review of this information, coupled with the fact that Quad Cities Units 1 and 2 operations and cooling systems are not expected to change significantly over the license renewal term, the staff concludes that the potential impacts to public health from microbiological organisms resulting from the Quad Cities Units 1 and 2 cooling-water discharges are SMALL, and further mitigation is not warranted.

## 4.2 Transmission Lines

The Final Environmental Statement for Quad Cities Units 1 and 2 (AEC 1972) describes four transmission lines that connect Quad Cities Units 1 and 2 with the transmission system – two lines to the Nelson substation, one line to the Davenport substation near Davenport, Iowa, and one line to Barstow substation near Rock Island, Illinois. Environmental impacts of the lines to the Davenport and Barstow substations were not evaluated in the FES because the lines were planned before Quad Cities, and the lines would have been built even if Quad Cities Units 1 and 2 had not been built. Changes to lines connecting Quad Cities Units 1 and 2 to the transmission system are described in the applicant's ER (Exelon 2003a). The changes include addition of a fifth line from Quad Cities to the Rock Creek substation, which is approximately 8 km (5 mi) north. The scope of this review includes the full length of all five lines.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to transmission lines from Quad Cities Units 1 and 2 are listed in Table 4-3. Exelon stated in its ER that it is not aware of any new and significant information associated with the renewal of the Quad Cities Units 1 and 2 OLs. The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping

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process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of those issues, the staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1 of the GEIS, for each of these issues follows:

- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of power line right-of-way management during the renewal term beyond those discussed in the GEIS.

**Table 4-3. Category 1 Issues Applicable to the Transmission Lines During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>
<b>TERRESTRIAL RESOURCES</b>	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collision with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3
Floodplains and wetland on power line right of way	4.5.7
<b>AIR QUALITY</b>	
Air quality effects of transmission lines	4.5.2
<b>LAND USE</b>	
Onsite land use	4.5.3
Power line right of way	4.5.3

- Bird collision with power lines. Based on information in the GEIS, the Commission found that

Impacts are expected to be of small significance at all sites.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock). Based on information in the GEIS, the Commission found that

No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Floodplains and wetlands on power line right of way. Based on information in the GEIS, the Commission found that

Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of power-line right-of-way on floodplains and wetlands during the renewal term beyond those discussed in the GEIS.



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- Air quality effects of transmission lines. Based on the information in the GEIS, the Commission found that

Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no air quality impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on information in the GEIS, the Commission found that

Projected onsite land use changes required during... the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no onsite land use impacts during the renewal term beyond those discussed in the GEIS.

- Power line right of way (land use). Based on information in the GEIS, the Commission found that

Ongoing use of power line right of ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of power line right of way on land use during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to transmission lines, and another issue related to transmission lines that is being treated as a Category 2 issue. These issues are listed in Table 4-4 and are discussed in Sections 4.2.1 and 4.2.2.

**Table 4-4. Category 2 and Uncategorized Issues Applicable to the Quad Cities Transmission Lines During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>	<b>10 CFR 51.53(c)(3)(ii) Subparagraph</b>	<b>SEIS Section</b>
<b>HUMAN HEALTH</b>			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

#### **4.2.1 Electromagnetic Fields, Acute Effects (Electric Shock)**

In the GEIS, the Commission found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC 1997) criteria, it is not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

The five lines that are within the scope of this review were examined by the applicant to identify the configuration where the potential for current-induced shock would be the greatest. The electric field strength and induced current were calculated for a large tractor-trailer truck parked beneath the line for each limiting configuration (Exelon 2003a; Exelon 2003b) using the AC/DCLINE computer code produced by the Electric Power Research Institute (EPRI 1992).

Calculated induced currents exceeded the NESC 5-mA induced current standard at only one location on the five lines within the scope of this review. The maximum calculated induced current on the North Nelson line was 6.0 mA at a location where the line crosses a county road. However, since large truck traffic on the road is very infrequent, it is considered unlikely that a large truck would park under the line.

The staff concludes that the impact of the potential for electric shock is MODERATE on the segment of the north Nelson line where calculated induced currents exceed 5 mA. Consideration of mitigation is warranted in the vicinity of this line segment. By letter dated September 22, 2003, the NRC staff informed Exelon Energy Delivery (who owns, operates, and

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maintains the portion of the transmission system to which this finding applies) of its findings (NRC 2003c). The impacts of the potential for electric shock are SMALL on the remaining portion of the north Nelson line, the south Nelson line, the Barstow line, the Rock Creek line, and the Davenport line where the induced currents are calculated to be 5 mA or less. No additional mitigation is warranted on these lines and line segments.

### 4.2.2 Electromagnetic Fields, Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or 2, and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy (DOE). A recent report (NIEHS 1999) contains the following conclusion:

The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement is not sufficient to cause the staff to change its position with respect to the chronic effects of electromagnetic fields. The staff considers the GEIS finding of "not applicable" still appropriate and will continue to follow developments on this issue.

## 4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to Quad Cities Units 1 and 2 in regard to radiological impacts are listed in Table 4-5. Exelon stated in the Quad Cities ER (Exelon 2003a) that it is not aware of any new and significant information associated with the renewal of the Quad Cities Units 1 and 2 OLS. The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the

GEIS (NRC 1996, 1999). For all of those issues, the staff concluded in the GEIS that the impacts are SMALL and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

**Table 4-5. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>
<b>HUMAN HEALTH</b>	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

Radiation doses to the public will continue at current levels associated with normal operations.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

## 4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-6. Exelon stated in its ER (Exelon 2003a) that it is not aware of any new and significant information associated with the renewal of the Quad Cities Units 1 and 2 OLS. Further, Exelon has determined that there is no need to undertake major refurbishment or replacement actions to maintain important systems, structures, and components during the license renewal period.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS (NRC 1996, 1999). For these issues, the staff concluded in the GEIS that the impacts are SMALL and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

**Table 4-6. Category 1 Issues Applicable to Socioeconomics During the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
<b>SOCIOECONOMICS</b>	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services: public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's

site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services: education (license renewal term). Based on information in the GEIS, the Commission found that

Only impacts of small significance are expected.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

No significant impacts are expected during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

No significant impacts are expected during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-7 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS.

## Environmental Impacts of Operation

**Table 4-7. Environmental Justice and GEIS Category 2 Issues Applicable to Socioeconomics During the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
<b>SOCIOECONOMICS</b>			
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public services, transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental justice	Not addressed <sup>(a)</sup>	Not addressed <sup>(a)</sup>	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice must be addressed in the licensee's environmental report and the staff's environmental impact statement.

### 4.4.1 Housing Impacts During Operations

To determine housing impacts, the applicant followed Appendix C of the GEIS (NRC 1996), which presents a population characterization method based on two factors, "sparseness" and "proximity" (GEIS Section C.1.4 [NRC 1996, 1999]). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS Table C.1), and a matrix is used to rank the population category as low, medium, or high (GEIS Figure C.1).

Data from the U.S. Bureau of the Census (USBC) 2000 Census of Population indicates that approximately 283,000 persons live within 32 km (20 mi) of the Quad Cities site. Within this radius, the population density is 86 persons/km<sup>2</sup> (224 persons/mi<sup>2</sup>). Thus, the Quad Cities site falls into Category 4 of the GEIS sparseness classification (greater than or equal to 46 persons/km<sup>2</sup> [120 persons/mi<sup>2</sup>] within 32km [20 mi] NRC 1996). In addition, there are five communities with populations exceeding 25,000 within 32 km (20 mi) of the Quad Cities site.

An analysis of data from the 2000 Census indicates that approximately 657,000 persons reside within 80 km (50 mi) of the Quad Cities site, for a population density of 32 persons/km<sup>2</sup> (83 persons/mi<sup>2</sup>) in this radius. The Census 2000 data show that one city, Davenport, Iowa, has a population of 98,359, which places the Quad Cities region in Category 2 proximity classification (no city with 100,000 or more persons and between 20 and 73 persons/km<sup>2</sup> [50 and 190 persons/mi<sup>2</sup>] within 80 km [50 mi]). However, Davenport grew at 3.2 percent over the 1990–2000 decade and within the next few years, it is possible that the Quad Cities region will

be in the Category 3 proximity classification (one or more cities with 100,000 or more persons and less than 73 persons/km<sup>2</sup> [190 persons/mi<sup>2</sup>] within 80 km [50 mi]).

Currently, the Quad Cities region is classified in sparseness Category 4 and proximity Category 2, resulting in classification of the Quad Cities region as a medium-population area according to the GEIS Sparseness and Proximity Matrix (NRC 1996). When the Davenport population exceeds 100,000, the region will be considered a high-population area. Therefore, the Quad Cities site is in a regional population context in which SMALL housing and employment impacts from license renewal would be expected.

In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, the NRC concluded that impacts on housing availability are expected to be of small significance at plants located in a medium-population area where growth-control measures are not in effect. The Quad Cities site is located in a medium-population area, and although Rock Island, Whiteside, and Scott counties and their municipal governments attempt to direct growth within the established growth boundaries without sprawl, growth-control measures are not in effect. Based on the NRC criteria, Exelon expects housing impacts to be SMALL during continued operations (Exelon 2003a).

SMALL impacts result when no discernible change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion is required to meet new demand (NRC 1996). The GEIS assumes that no more than a total additional staff of 60 permanent workers might be needed at each unit during the license renewal period to perform routine maintenance and other activities related to license renewal. Although Exelon expects to perform these routine activities during scheduled outages, they assumed they would not add more than 60 total employees to their permanent staff during the license renewal period (Exelon 2003a). This addition of 60 permanent workers, plus 139 indirect jobs (Exelon 2003a), would result in an increased demand for a total of 199 housing units around the Quad Cities site (153 housing units for Rock Island, Whiteside, and Scott counties).<sup>(a)</sup> The demand for the existing housing units could be met with the construction of new housing or use of existing, unoccupied housing. In an area that has a population of more than 368,000, this demand would not create a discernible change in housing availability, change in rental rates or housing values, or spur much new construction or conversion. As a result, Exelon concludes that the impacts would be SMALL and mitigation measures would not be necessary (Exelon 2003a).<sup>(b)</sup>

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(a) This assumes 77 percent of the new hires reside in the three counties (See Section 2.2.8.1).

(b) Exelon's estimate of 153 housing units is likely to be an "upper bound" estimate. Most of the potentially new jobs would most likely be filled by existing area residents, thus creating no, or little, net demand for housing.



## Environmental Impacts of Operation

The staff reviewed the available information relative to housing impacts and Exelon's conclusions. Based on this review, the staff concludes that the impact on housing during the license renewal period would be SMALL, and further mitigation is not warranted.

### 4.4.2 Public Services: Public Utility Impacts During Operations

An analysis of impacts on the public water supply system considered both plant demand and plant-related population growth. Section 2.2.2 describes the Quad Cities Units 1 and 2 permitted withdrawal rate and actual use of water. The plant is not connected to a municipal water system because it uses groundwater from its own wells. Exelon plans no refurbishment in conjunction with this license renewal, so plant demand will not change beyond current demands (Exelon 2003a).

To estimate the potential increase in demand for water resulting from new employment, it was assumed that there might be an increase of up to 60 permanent employees during license renewal, which might result in 199 direct and indirect new jobs, that, given the average household size, would result in a net overall population increase of approximately 516 persons and 199 households as a result of those jobs. These were distributed according to the current distribution of Quad Cities employees across the three most affected counties, Rock Island and Whiteside counties in Illinois and Scott County in Iowa and compared with the water service capacities of the larger water service companies in these counties (Exelon 2003a). Table 4-8 shows the results of these estimates. The staff finds that the impact of increased water use on area water systems is SMALL and that further mitigation is not warranted.

**Table 4-8. Water Supply and Estimated Potential Additional Consumption from Direct and Indirect New Employment During the Renewal Term**

County	Estimated Number of Persons	Consumption (Based on 80 Gallons/day)	Water Supplier Capacity	Additional Consumption Capacity
Rock Island	122	9760	53 MGD	0.02%
Whiteside	165	13200	16.5 MGD	0.08%
Scott	118	9440	32 MGD	0.03%

Source: Exelon 2003a.

### 4.4.3 Offsite Land Use During Operations

Offsite land use during the license renewal term is a Category 2 issue (10 CFR 51, Subpart A, Appendix B, Table B-1). Table B-1 of 10 CFR 51 Subpart A, Appendix B notes that "significant

changes in land use may be associated with population and tax revenue changes resulting from license renewal.”

Section 3.7.5 and 4.7.4 of the GEIS define the magnitude of land-use changes as **SMALL** if little new development and minimal changes to an area's land-use pattern result. **MODERATE** change results if considerable new development and some changes to the land-use pattern occur. The magnitude of change is **LARGE** if large-scale new development and major changes in the land-use pattern occur.

Exelon has identified a maximum of 60 additional employees during the license renewal term plus an additional 139 indirect jobs (total 199) in the surrounding community (Exelon 2003a). Using this upper-bound employment assumption, the staff calculated that there could be an increase in total population within the two states of 517 people during the license renewal term.

Section 3.7.5 of the GEIS (NRC 1996) states that if plant-related population growth is less than 5 percent of the study area's total population, offsite land-use changes would be small, especially if the study area has established patterns of residential and commercial development, a population density of at least 23 persons/km<sup>2</sup> (60 persons/mi<sup>2</sup>), and at least one urban area with a population of 100,000 or more within 80 km (50 mi). Population growth related to Quad Cities license renewal will be less than 5 percent of the area's 2000 total population of 654,509; the area has established patterns of residential and commercial development, a population density of well over 32 persons/km<sup>2</sup> (83 persons/mi<sup>2</sup>), and the conjoined urban area (Quad Cities Metropolitan Statistical Area composed of Davenport and Bettendorf, Iowa, and Rock Island, Moline, and East Moline, Illinois) with a population of 359,062 in 2000 within the 80-km (50-mi) radius. Consequently, the staff concludes that population changes resulting from license renewal are likely to result in **SMALL** offsite land-use impacts.

Tax revenue can affect land use because it enables local jurisdictions to be able to provide the public services (e.g., public facilities and utilities) necessary to support development. Section 4.7.4.1 of the GEIS states that the assessment of tax-driven, land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven, land-use changes during the plant's license renewal term would be **SMALL**, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdiction's revenue, the significance level would be **SMALL**. If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven, land-use changes would be **MODERATE**.

## Environmental Impacts of Operation

Annual property taxes from Quad Cities Units 1 and 2 accounted for approximately 2.7 percent of Rock Island County's total levee extension and approximately 2.8 percent of the county's total collections available for distribution for the years 1997 to 2000. However, the local Cordova taxing districts for the township, library, school district, road and bridge district, and fire department derive significant revenue (31 to 73 percent of their total revenue from all sources) from the plant (Rock Island County Board of Review 2002).

Negotiations are underway between Exelon and Rock Island County for a graduated reduction in payments to minimize the financial disruption to county and local operations caused by a change in the methods of plant value assessment due to the deregulation of the utility industry in the State of Illinois (Exelon 2003a). The local taxing districts that rely on the plant for a large portion of their revenue will be adversely affected to a significant degree by the decline in tax receipts. However, this decline is not related to the proposed license renewal for Quad Cities Units 1 and 2.

Since no major refurbishment activities are planned at the Quad Cities site during the license renewal term, no new incremental sources of plant-related tax payments are expected that could influence land use in Rock Island County by fostering considerable growth. Therefore, the staff concludes that tax-related land use impacts caused during the plant's license term renewal are SMALL.

Rock Island County utilizes four major tools in an effort to manage growth and sprawl throughout the county. Strong farmland preservation policies in Rock Island County dictate that settlement is to occur mainly in existing municipalities rather than in rural unincorporated areas (Bi-State 2002). Similarly, Scott County, Iowa and Whiteside County, Illinois, also seek to guide their counties' development. Therefore, any possible population growth emanating from plant property taxes or employment during the plant's license renewal term are likely to be channeled to county-targeted growth locations where utilities, facilities, and services can accommodate growth and thus the impacts of these changes would be SMALL.

Based on the information presented above, the staff concludes that offsite land-use impacts are likely to be SMALL and additional mitigation is not warranted.

### **4.4.4 Public Services: Transportation Impacts During Operations**

Currently, Quad Cities employs approximately 850 staff and 130 contract/matrixed workers. The upper-bound potential increase in permanent staff during the license renewal term is 60 additional workers, or approximately 6 percent of the current permanent and contract workforce of approximately 980 employees. The State of Illinois Department of Transportation does not make level of service (LOS) determinations in rural, non-metropolitan areas such as

the Quad Cities site, unless it is deemed necessary, and therefore, none of the roads in the vicinity of the site has had a LOS determination.

The staff reviewed Exelon's assumptions and resulting conclusions. The staff concludes that any impact of Quad Cities employees on transportation service degradation is likely to be **SMALL** and does not require further mitigation.

#### **4.4.5 Historic and Archaeological Resources**

The National Historic Preservation Act (NHPA), as amended through 1992, requires Federal agencies to take into account the potential effects of their undertakings on historic properties. The historic-review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation in 36 CFR Part 800, as amended through 2001. Renewal of an OL for a nuclear power plant is an undertaking that could possibly affect either known or potential historic properties that may be located at the plant. Therefore, in accordance with the provisions of NHPA, the NRC is required to make a reasonable effort to identify historic properties in the area of potential effect. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Office before proceeding. If it is determined that historic properties are present, the NRC is required to assess and resolve possible adverse effects of the undertaking. In general, lands within the boundaries of a nuclear-plant site fall into one of the following categories:

- (1) **Areas with No Potential for archaeological resources.** These areas include lands where past disturbances related to the construction of the power station and appurtenant facilities have taken place to such an extent that once-extant cultural resources are no longer present. No further archaeological investigations would be recommended for these areas.
- (2) **Areas with Low Potential for archaeological resources.** Lands within the plant site that fall into this category are those that are relatively undisturbed but that possess characteristics that would normally indicate a low possibility for most types of cultural resources to occur. For the most part, these lands have a degree of slope greater than 15 percent. For most of these areas, further archaeological work would not be necessary, although there could be smaller areas within the larger zone where specific ground conditions could require investigation.
- (3) **Areas with Moderate-to-High Potential for archaeological resources.** These areas are classified as those that are relatively undisturbed by past activities and have a likelihood for prehistoric and historic archaeological sites, according to local models of prehistoric and historic land use and settlement patterning. Archaeological investigation would be recommended prior to undertaking any ground-disturbing activities in these areas.

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The Quad Cities site is an area of moderate-to-high potential. There are no known historic resources at the Quad Cities site. However, there are reports of archaeological resources on the Quad Cities site (Bareis 1972a, 1972b). A prehistoric Woodland-period archaeological site associated with Quad Cities property was recorded by archaeologists in 1933. In 1972, archaeologists found some areas of archaeological interest in a reconnaissance during construction of a spray canal.

The Quad Cities property has not been investigated by professional archaeologists at a level that would conclusively determine the current presence or absence of archaeological sites, or define the significance of any such resources that may exist on these lands. The Quad Cities license renewal application for continued operations does not include proposals for future land-disturbing activities or structural modifications beyond routine maintenance at the plant nor does it guarantee against such disturbances.

Exelon initiated communication with the Iowa and Illinois state historic preservation offices by letters dated April and January of 2002 (Jury 2002a, 2002b). The letters express Exelon's desire to assess the effects of the license renewal on historic properties, as required by the NRC of applicants for operating license renewal. The letters specifically include within the purview of the undertaking the Quad Cities site itself and five related transmission lines built to connect Quad Cities to the regional transmission system. The applicant notes in its letters that it does not expect the operation of Quad Cities, including maintenance of the identified transmission lines, through the license renewal term to adversely affect cultural or historical resources. The applicant further notes in the letters that "No major structural modifications have been identified for the purposes of supporting license renewal. Any maintenance activities necessary to support license renewal would be limited to previously disturbed areas. No additional land disturbance is anticipated in support of license renewal." Finally, a request is made in the letters for state concurrence with a determination that operations at Quad Cities during the period of the license renewal would have "...no effect on any historic or archeological properties."

Both the Illinois and Iowa historic preservation offices responded to the applicant's letters, concurring that the operation and management of the Quad Cities Units 1 and 2 would not affect historic properties. The Illinois Historic Preservation Agency wrote on February 7, 2002, that it had reviewed the undertaking in accordance with regulations to implement Section 106 of the National Historic Preservation Act. Illinois authorities agreed that no historic properties are affected by the undertaking as described by the applicant (Haaker 2002). The State Historical Society of Iowa wrote on June 24, 2002, that it had reviewed the information submitted by the applicant. Iowa authorities agreed that they "could concur with a determination of no historic properties affected" if the project occurred as described by the applicant and if the NRC petitioned for the state's views in accordance with regulations to implement Section 106 of the National Historic Preservation Act (Jones 2002).

The NRC forwarded letters to the state historic preservation offices in Iowa and Illinois. The letters include a request for confirmation of their previous conclusion that no historic properties are affected by the decision to renew the Quad Cities license (NRC 2003a and 2003b). In letters dated February 26, 2004, state historic preservation offices in Iowa and Illinois concurred that no historic properties are affected by the proposed license renewal (Haaker 2004; Jones 2004).

The staff reviewed the applicant's assumptions and resulting conclusions as they relate to historic and archaeological resources and determined that archaeological resources have been found on the Quad Cities site. The setting of the Quad Cities site adjacent to the Mississippi River, combined with the reports of archaeological finds on and adjacent to the station, indicate a high potential for discovery of significant resources. These considerations require adequate plans to protect archaeological sites from inadvertent disturbance or destruction. The staff found that procedures in place were not protective of archaeological resources that may be present at the Quad Cities site. Exelon modified the procedures to include the following two provisions (Exelon 2003c):

- Contact the Illinois Historic Preservation Agency for guidance on requirements for an archaeological survey when any undertaking would disturb sediments at the station at depths below previous disturbance, or below the present surface in previously undisturbed areas. [Note: previous disturbance is defined by the documented disturbance area and depth for projects previously reviewed by the NRC and determined to be not significant. Areas or sediments that extend beyond these boundaries are previously undisturbed.]
- Once guidance is received from the Illinois Historic Preservation Agency, adhere to that guidance.

Based on the staff's review and the procedure changes implemented by the applicant, the impact of license renewal on historic and archaeological resources is **SMALL** and additional mitigation is not warranted.

#### 4.4.6 Environmental Justice

Environmental justice refers to a Federal policy in which Federal actions should not result in disproportionately high and adverse impacts on minority<sup>(a)</sup> or low-income populations. Executive Order 12898 (59 FR 7629) directs Federal executive agencies to consider environmental justice under NEPA. The Council on Environmental Quality (CEQ) has provided

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(a) The NRC guidance for performing environmental justice reviews defines "minority" as American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, Black races, or Hispanic ethnicity. "Other" races and multiracial individuals may be considered as separate minorities (NRC 2001).

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guidance for addressing environmental justice (CEQ 1997). Although the Commission is not subject to the Executive Order, the Commission has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in the NRC Office of Nuclear Reactor Regulation Office Instruction LIC-203, *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 2001).

For the purpose of the staff's review, a minority population is defined to exist if the percentage of minorities within the census block groups<sup>(a)</sup> in each state within the 80 km (50 mi) potentially affected by the renewal of Quad Cities Units 1 and 2 operating licenses exceeds the corresponding percentage of minorities in the state of which it is a part by 20 percentage points, or if the corresponding percentage of minorities within the census block group is at least 50 percent. A low-income population is defined to exist if the percentage of low-income population within a census block group exceeds the corresponding percentage of low-income population in the state of which it is a part by 20 percentage points, or if the corresponding percentage of low-income population within a census block group is at least 50 percent. For census block groups within Rock Island and Whiteside counties, for example, the percentage of minority and low-income populations is compared to the percentage of minority and low-income populations in Illinois. For block groups in Scott County, the percentage of minority and low-income populations is compared with the percentage of minority and low-income populations in Iowa.

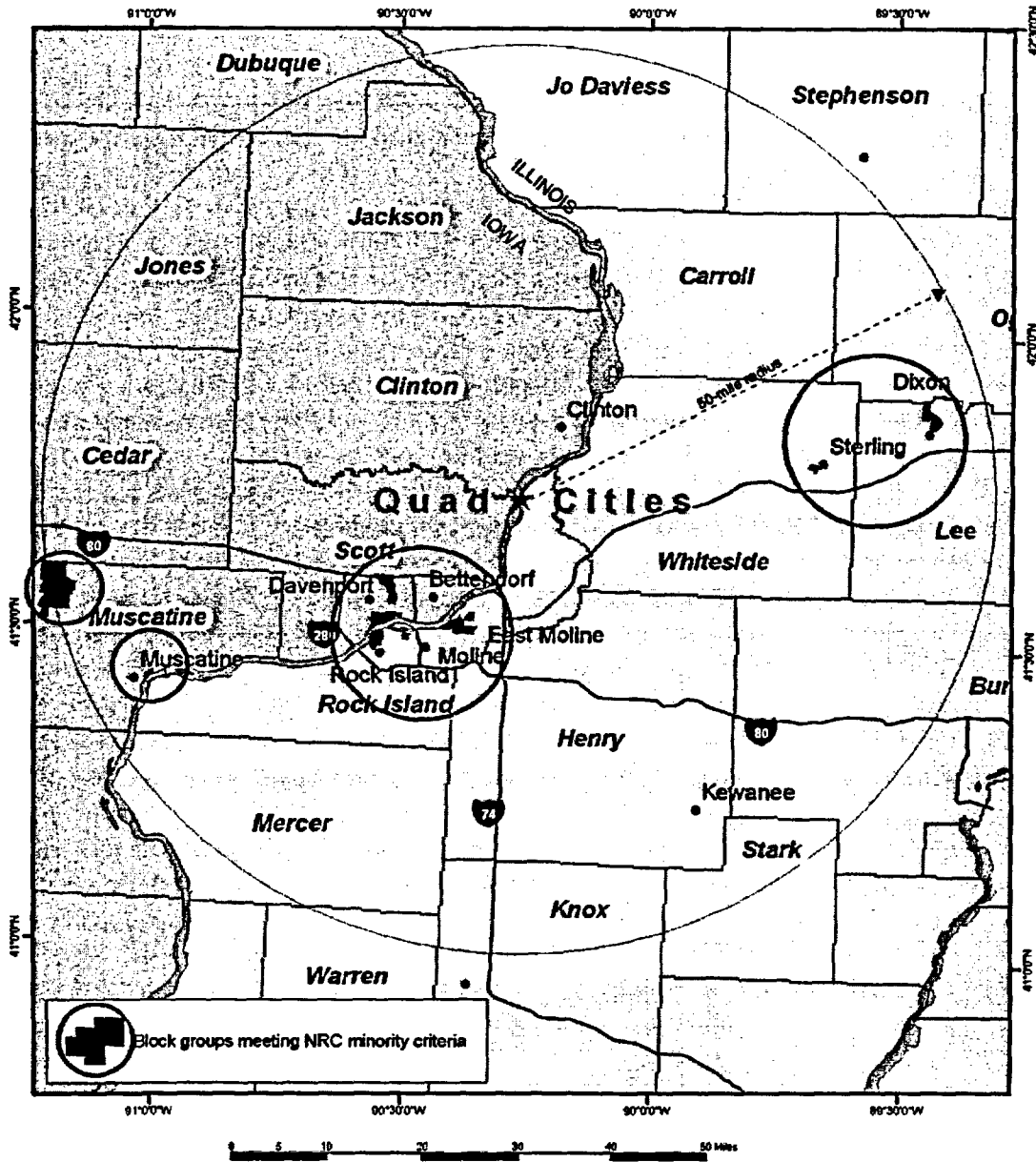
Exelon used U.S. Bureau of the Census 2000 data for the minority portion of the Environmental Justice calculations and Census 1990 data for the low-income portion of the Environmental Justice calculations, the most current data available at the time of publication of the ER (Exelon 2003a). This discussion of minority and low-income status relies on Census 2000 data, which now includes both population and economic data. Geographic Information System (GIS) software was used to analyze Census 2000 population data. The census data used are from Geolytics, Inc. (Geolytics, 2000).

Figure 4-1 shows the location of census block groups identified as having minority status, according to the above criteria. Figure 4-2 shows the location of census block groups identified as low-income status, according to NRC criteria.

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(a) A census block group is a combination of census blocks, which are statistical subdivisions of a census tract. A census block is the smallest geographic entity for which the Census Bureau collects and tabulates decennial census information. A census tract is a small, relatively permanent statistical subdivision of counties delineated by local committee of census data users in accordance with Census Bureau guidelines for the purpose of collecting and presenting decennial census data. Census block groups are subsets of census tracts (USBC 1999).

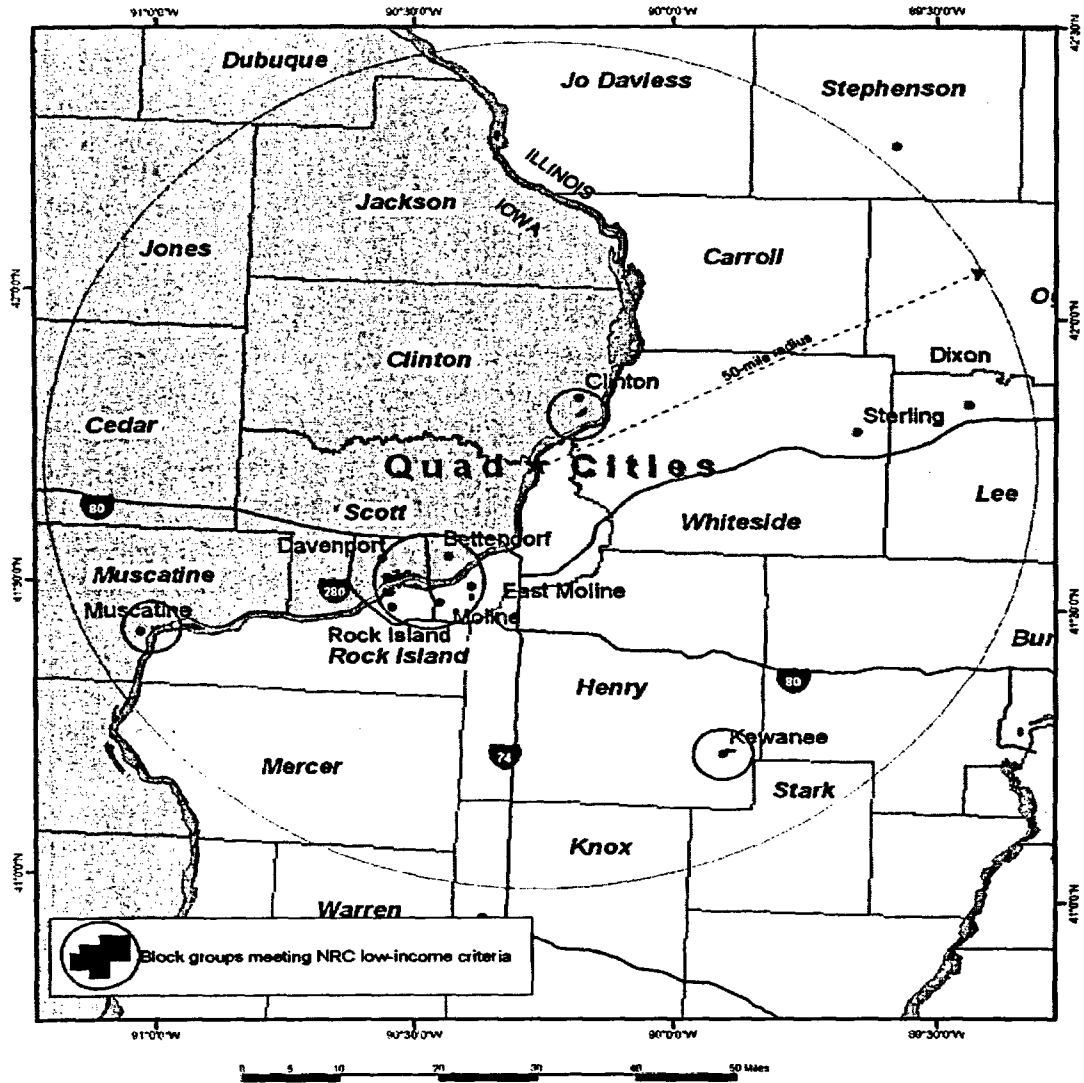
# Environmental Impacts of Operation



**Figure 4-1.** Geographic Distribution of Minority Populations (shown in shaded areas) Within 80 km (50 mi) of Quad Cities Based on 2000 Census Block Group Data



# Environmental Impacts of Operation



**Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of Quad Cities Based on 1990 Census Block Group Data**

The closest minority-status block groups to the Quad Cities site are in the East Moline/Moline area, approximately 24 km (15 mi) south of the plant. The low-income block groups nearest the plant are in the vicinity of Clinton, Iowa, about 14 km (9 mi) north of the Quad Cities site; the next nearest block groups to the plant are in the East Moline area about 24 km (15 mi) south of the plant. With the locations of minority and low-income populations identified, the staff proceeded to evaluate whether any of the environmental impacts of the proposed action could affect these populations in a disproportionately high and adverse manner. Based on staff guidance (NRC 2001), air, land, and water resources within 80 km (50 mi) of the Quad Cities site were examined. Within that area, of the potential environmental impacts that could affect human populations, all of these were considered SMALL for the general population.

The pathways through which the environmental impacts associated with the Quad Cities license renewal can affect human populations are discussed in each associated section. The staff then evaluated whether minority and low-income populations could be disproportionately affected by these impacts. The staff found no unusual resource dependencies or practices, such as subsistence agriculture, hunting, or fishing through which the populations could be disproportionately affected. In addition, the staff did not identify any location-dependent disproportionate impacts affecting these minority and low-income populations. The staff concludes that offsite impacts from Quad Cities to minority and low-income populations would be SMALL and no additional mitigation actions are warranted.

## 4.5 Groundwater Use and Quality

There are no Category 1 issues related to groundwater use and quality for Quad Cities Units 1 and 2. The Category 2 issues related to groundwater use conflicts during the renewal term that are described in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 and applicable to Quad Cities Units 1 and 2 are discussed in the section that follows and are listed in Table 4-9.

**Table 4-9. Category 2 Issue Applicable to Groundwater Use Conflicts of the Quad Cities Units 1 and 2 During the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(II) Subparagraph	SEIS Section
<b>AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT-DISSIPATION SYSTEMS)</b>			
Groundwater use conflicts (potable and service water, and dewatering; plants that use >100 gpm)	4.8.1.1; 4.8.1.2	C	4.5

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For plants using greater than 100 gallons per minute (gpm) of groundwater, the potential use conflict is a Category 2 issue, requiring a site-specific assessment prior to license renewal.

The staff independently reviewed the Quad Cities ER (Exelon 2003a) and visited the site.

The NRC made groundwater use conflicts a Category 2 issue because, at a withdrawal rate of more than 100 gpm, a cone of depression could extend offsite. This could deplete the groundwater supply available to offsite users, an impact that could warrant mitigation. Information needed to address this issue includes: (1) the Quad Cities Units 1 and 2 groundwater withdrawal rate (whether greater than 100 gpm), (2) the drawdown at offsite location, and (3) impact on neighboring wells.

Quad Cities groundwater use has averaged 45 L/s (717 gpm) over the last 10 years and, therefore, the issue of groundwater use conflicts does apply. In the winter of 1997, groundwater was used to heat the water in the fish-rearing facility while the plant was shut down. During this period, groundwater use from Well 7 was six times normal use. Without this period of high use, the 10-year average yield for the site is approximately 31.9 L/s (505 gpm).

The Quad Cities site is located in the Meredosia Channel, an ancient channel of the Mississippi River. The Meredosia Channel has been filled over many thousands of years with unconsolidated sediments ranging in depth from approximately 15 to 91 m (50 to 300 ft) (Blume 1966). Water for industrial and home use in the region comes from both wells and the Mississippi River.

Groundwater resources in the region are developed from three aquifer systems. These consist of the alluvial aquifer, the shallow Silurian dolomite aquifer, and the artesian Cambrian-Ordovician aquifer. Some wells within a few miles of the station pump at rates up to 44.2 L/s (700 gpm). These are in the upper alluvial aquifer at depths of 6 to 30 m (20 to 100 ft) below ground surface (AEC 1972). Groundwater in the area is encountered at depths from approximately 5 to 6 m (17 to 21 ft). The groundwater gradient in this aquifer is relatively flat and generally flows to the Mississippi River, except during periods of high river flow (Blume 1966).

During periods of pumping, groundwater levels in site wells are monitored by Exelon to determine whether drawdown is taking place that might impact offsite groundwater users. Due to extensive reservoir of groundwater associated with the Meredosia Channel, it is unlikely that Quad Cities operation would result in noticeable changes in the groundwater levels and Exelon has not observed a lowering of water levels in site wells (Exelon 2003a). Therefore, groundwater use conflict impacts would be SMALL, if any, and mitigation measures would not be warranted.

## 4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-10.

**Table 4-10. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>	<b>10 CFR 51.53(c)(3)(ii) Subparagraph</b>	<b>SEIS Section</b>
<b>THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)</b>			
Threatened or endangered species	4.1	E	4.6

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by the continued operation of the nuclear power plant during the license renewal term. The presence of threatened or endangered species in the vicinity of the Quad Cities site is discussed in Sections 2.2.5 and 2.2.6. On January 11, 2002, Exelon corresponded with the FWS and requested information on the potential impacts of relicensing on threatened and endangered species (Jury 2002c). The FWS indicated that they had no objection to the relicensing action on February 12, 2002 (Millar 2002). On March 12, 2003, the NRC independently contacted the FWS to request information on threatened and endangered species and the impacts of relicensing (NRC 2003c). In response, on June 6, 2003, the FWS provided additional information regarding federally listed species that have been observed or may occur in the vicinity of the Quad Cities site and its associated transmission lines (Nelson 2003a). On August 12, 2003, the NRC requested additional information from the FWS for an expanded scope of the transmission lines under review for re-licensing (NRC 2003d). The FWS responded on September 15, 2003, with the requested information (Nelson 2003b).

The staff has prepared a biological assessment evaluating the potential impacts on aquatic and terrestrial threatened, endangered, or candidate species resulting from the operation of Quad Cities for an additional 20 years during the license renewal period. The staff concluded that Quad Cities license renewal will have no effect on the Higgins' eye pearl mussel, Indiana bat, Iowa Pleistocene snail, bald eagle, western prairie fringed orchid, eastern prairie fringed orchid and the prairie bush-clover. In a letter dated December 4, 2003, the staff transmitted the staff's biological assessment to the FWS and requested concurrence on staff's determination (NRC, 2003d). The FWS concurred with the staff's conclusions in a letter dated January 15, 2004 (Nelson 2004). The staff's biological assessment and the letter from FWS are included in Appendix E to this SEIS.

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### 4.6.1 Aquatic Species

As described in Section 2.2.5, the Higgins' eye pearlymussel (*Lampsilis higginsii*) is the only Federally listed (endangered) aquatic species in the vicinity of the Quad Cities site. As discussed in Section 2.2.5, an Essential Habitat Area for the Higgins' eye pearlymussel is located 1.6 to 4.0 km (1.0 to 2.5 mi) downstream from the Quad Cities site. The presence of the Higgins' eye pearlymussel in this area suggests that past operation of Quad Cities Units 1 and 2 has not adversely affected the species. In addition, Quad Cities Units 1 and 2's cooling-water intake and discharge are closely monitored under the NPDES program, and permit limits are reviewed on a regular basis by state regulatory agencies to ensure the protection of aquatic biota (Exelon 2003a).

There are no plans to conduct refurbishment or construction at Quad Cities Units 1 and 2. Therefore, the staff has concluded that continued operation of the plant under license renewal is not likely to adversely affect the Higgins' eye pearlymussel. The FWS concurred with the staff conclusions in a letter dated January 15, 2004 (Nelson 2004). Thus, it is the staff's findings that the impact on threatened or endangered aquatic species from an additional 20 years of operation of Quad Cities Units 1 and 2 would be SMALL, and additional mitigation is not warranted.

### 4.6.2 Terrestrial Species

Federally listed threatened and endangered terrestrial species that have the potential to occur on or in the vicinity of the Quad Cities site or the transmission lines associated with Quad Cities Units 1 and 2 are described in Section 2.2.6. These species include the Indiana bat, Iowa Pleistocene snail, bald eagle, western prairie fringed orchid, eastern prairie fringed orchid and the prairie bush-clover.

All species presented in Table 2-3 could occur in counties within which Quad Cities Units 1 and 2 are located or which are traversed by transmission lines associated with Quad Cities Units 1 and 2. These listed species are associated with upland woodlands, prairie, algific (i.e., cold producing) talus slopes, riparian and open water habitats. Although most of the transmission lines transverse agricultural areas, some natural habitats are crossed (e.g., the Upper Mississippi River NWFR). However, the bald eagle is the only Federally listed species that has been observed or documented to occur along the transmission lines. One other Federally listed species, the Iowa Pleistocene snail, is known to occur on north-facing slopes of driftless areas (i.e., areas with little or no glacial deposits) in Clinton County, Iowa, occupying algific talus slopes at the outlet of underground ice caves along limestone bluffs (Nelson 2003a). This highly restricted habitat is not likely to be found at the site or along the transmission lines.

No documented occurrences of other Federally listed species in Table 2-3 have been noted along these transmission lines, within their ROWs, or in the vicinity of Quad Cities Units 1 and 2.

Bald eagles visit the open water and riparian habitats on or near Quad Cities Units 1 and 2, as well as its Davenport and Rock Creek transmission lines, during winter migration and use this area for summer nesting. Foraging bald eagles may be attracted to the open water areas in the Mississippi River caused by the plant's thermal discharge during the winter months when the river is icing over (Nelson 2003a). Approximately one to two bald eagles per year have been observed by FWS to collide with the Rock Creek transmission line, in the segment that crosses the Mississippi River, with subsequent mortality.<sup>(a)</sup> However, relative to the numbers of bald eagles in the area, this impact is observed to be of small significance.<sup>(a)</sup>

Although no management actions for bald eagle nesting and breeding areas (i.e., those actions recommended by the Management Guidelines and Breeding Areas of the Northern States Recovery Plan for the Bald Eagle [Grier et al. 1983]) have been needed along the Quad Cities transmission lines, it is anticipated that Exelon, MidAmerican, Alliant, and their vegetation management contractors would implement such actions upon identification of a nest. Vegetation management staff would follow Best Management Practices (BMPs) to identify needed management actions and implement them to protect the bald eagle and its habitat. Additionally, it is anticipated that appropriate raptor incident reporting for any incidences of bald eagle injury or mortality along these transmission lines would be carried out by Exelon, MidAmerican, Alliant and their vegetation management contractors. Currently, no bald eagle incident reports have been necessary due to no observed injuries or mortalities in the area of Quad Cities and its transmission lines by Exelon or its contractors.

The NRC assessed the impacts of transmission lines on avian populations in its GEIS on the effects of nuclear power plant license renewal (NRC 1996). In the GEIS, the NRC concluded that mortality resulting from bird collisions with transmission lines associated with license renewal and an additional 20 years of operation would be of small significance. This conclusion was based on: (1) no indication in the existing literature that collision mortality is high enough to result in population-level effects and, (2) the lack of known instances where nuclear power plant lines affect large numbers of individuals in local areas.

Although undeveloped areas of the Quad Cities site have not been surveyed for Federally listed species, these areas are not affected by ongoing plant operations and no refurbishment activities that could disturb these areas are planned. In addition, maintenance activities occurring along the transmission lines are limited by using a vegetation management strategy

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(a) Personal communication with E. Britton, District Manager, Savanna District, Upper Mississippi National Wildlife and Fish Refuge, May 8, 2003.

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that minimizes the need for cutting, mowing, and the application of herbicides (Cunningham 2003; Exelon 2003d; Exelon 2003e).

Based on the staff's review of the applicant's environmental report, the staff's independent analysis, and consultation with the FWS, the staff has concluded that continued operation of the plant during the license renewal term is not likely to adversely affect the bald eagle and will have no effect on other listed or proposed endangered or threatened species within the immediate vicinity of Quad Cities site and its associated transmission lines. This conclusion, contained in the staff's biological assessment, was submitted to the FWS in December 2003. The FWS concurred with the staff's biological assessment in a letter dated January 15, 2004 (Nelson 2004). The applicant currently plans no power plant refurbishment activities. The staff anticipates that BMPs for protecting Federally listed species and their habitats, while carrying out vegetation management activities, will be implemented by Exelon, MidAmerican, Alliant, and their contractors. Therefore, it is the staff's finding that the impact on threatened or endangered species of an additional 20 years of operation of Quad Cities Units 1 and 2, and the associated transmission lines, would be SMALL and further mitigation is not warranted.

### **4.7 Evaluation of Potential New and Significant Information on Impacts of Operation During the Renewal Term**

The staff has not identified any new and significant information on environmental issues listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, related to operation during the renewal term from the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Processes for identification and evaluation of new information are described in Section 1.2.2, License Evaluation Process.

### **4.8 Cumulative Impacts of Operations During the Renewal Term**

The staff considered potential cumulative impacts during the evaluation of information applicable to each of the potential impacts of operations during the renewal term identified within the GEIS. For the purposes of this analysis past actions were those related to the resources at the time of the plant licensing and construction, present actions are those related to the resources at the time of current operation of the power plant, and future actions are considered to be those that are reasonably foreseeable through the end of plant operation. Therefore, the analysis considers potential impacts through the end of the current license term, as well as the 20-year license renewal term. The geographical area over which past, present, and future actions that could contribute to cumulative impacts is dependent on the type of action considered, and is described below for each impact area.

The impacts of the proposed action, as described in Section 4.0, are combined with other past, present, and reasonably foreseeable future actions which would affect the same resources impacted by Quad Cities regardless of what agency (Federal or non-Federal) or person undertakes such other actions. These combined impacts are defined as "cumulative" in 40 CFR 1508.7 and include individually minor but collectively significant actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

#### **4.8.1 Cumulative Impacts Resulting from Operation of the Plant Cooling System**

For the purposes of this analysis, the geographic area considered for cumulative impacts resulting from operation of the Quad Cities Units 1 and 2 cooling system is the Upper Mississippi River,<sup>(a)</sup> particularly within Pool 14. As discussed in Section 4.1, the staff found no new and significant information indicating that the conclusions regarding any of the cooling system-related Category 1 issues as related to Quad Cities are inconsistent with the conclusions in the GEIS (NRC 1996). Additionally, the staff determined that none of the cooling system-related Category 2 issues were likely to have greater than a SMALL impact on local water quality and aquatic resources.

The cumulative effects of past actions have resulted in the existing conditions on local water quality and aquatic resources. Section 2.2.5 discusses the major changes and modifications within the Upper Mississippi River that have had the greatest effects on aquatic resources. These include agriculture, forestry, natural resource utilization (e.g., pearl button industry and commercial and recreational fishing), river modifications, and industrial, municipal, and residential developments. The 29 navigation dams constructed to create the 2.7-m (9-ft) navigation channel between St. Louis, Missouri and Minneapolis, Minnesota have created broad, shallow impoundments within the Upper Mississippi River. Dredging is routinely required in some reaches to maintain the navigation channel (Fremling and Drazkowski 2000). Dams and levees have caused increased sedimentation within the river. Some reaches of the river are polluted from past industrial and agricultural discharges (USGS 1999).

The lock and dam system has increased the water surface per linear mile of river, which has increased total photosynthesis of the river. This has resulted in an increase in pounds of fish per linear mile than existed before river impoundment. However, there have been general decreases in floodplain forests, submerged aquatic plants, freshwater mussels, fingernail

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(a) The Upper Mississippi River is the 1667-km (1036-mi) reach from St. Anthony Falls in Minnesota to the mouth of the Ohio River at Cairo, Illinois.



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clams, other bottom-dwelling invertebrates, and some fish species (Fremling and Drazkowski 2000). Also, movement of many fish species throughout the Upper Mississippi River has been impeded by the dams (USGS 1999). As the quantity and quality of backwater habitat has become increasingly scarce and degraded due to sedimentation, riverine fish species have increased in abundance while lacustrine species have decreased (Bowzer and Lippincott 2000). However, there is little evidence to suggest that there has been a substantial net loss of fish species in the Upper Mississippi River since the 1800s (USGS 1999).

Non-native species (e.g., common carp, grass carp, purple loosestrife, Eurasian milfoil, and zebra mussel) are also adversely impacting native species. The zebra mussel has been particularly devastating to native freshwater mussels (Fremling and Drazkowski 2000); and the common carp now comprises most of the commercial harvest and is the dominant species in the Upper Mississippi River (USGS 1999).

Management and protection of fish and wildlife resources are provided, in part, by the three National Wildlife Refuges contained within the Upper Mississippi River: Upper Mississippi River National Wildlife and Fish Refuge, Trempealeau National Wildlife Refuge, and the Mark Twain National Wildlife Refuge (Fremling and Drazkowski 2000).

The staff concludes that the SMALL impacts of Quad Cities Units 1 and 2 cooling system operations, including entrainment and impingement of fish and shellfish, heat shock, or any of the cooling system-related Category 1 issues are not contributing to an overall decline in water quality or the status of the fishery or other aquatic resources. The annual stocking of walleye and hybrid striped bass by Quad Cities has contributed to an increase in gamefish resources within Pool 14, with lesser increases within several downstream pools (LaJeone and Monzingo 2000).

Future contributions to cumulative impacts to aquatic resources within the Upper Mississippi River would generally occur from those actions that currently cause impacts (e.g., maintenance of the navigation channel and associated barging, human habitation, urban and industrial development, agriculture, commercial and recreational fisheries, and spread of non-native species). Proposed increases in commercial traffic within the river may increase the rate of sedimentation (Fremling and Drazkowski 2000). The quality of the aquatic resources within the Upper Mississippi River will continue to decline unless inputs of sediments, nutrients, and toxic substances are reduced or eliminated (Fremling and Drazkowski 2000). It is predicted that without active management (e.g., habitat rehabilitation), the navigation pools within the Upper Mississippi River will continue to progress toward shallow, more uniform conditions. This will lead to poorer water and substrate quality, reduction of submerged aquatic plant and benthic invertebrate populations, and less diverse fish communities (USGS 1999).

There is a potential for severe impacts to aquatic resources from large oil or chemical spills within the Upper Mississippi River, but the risk of such spills is relatively small. However, a

major oil spill did occur in the Mississippi River in 1963 (UMRCC 1993). The probability of smaller spills is higher, but the impacts from such spills would probably be small, temporary, and additive and unlikely to severely affect aquatic resources, especially if spill response activities are undertaken when such events occur.

The non-native round goby (*Neogobius melanostomus*), which is currently common in the Upper Illinois Waterway, may be a future threat to the Upper Mississippi River. It is an aggressive and highly territorial species that can displace native species and eat their eggs. It also has a high reproductive potential and tolerates extreme water-quality conditions (USGS 1999). Five species of Asian carp now occur in the United States. As mentioned, the common carp is a dominant species within the Upper Mississippi River. The grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*) and bighead carp (*H. nobilis*) have also become established within the Upper Mississippi River during the past 20 years (Chick 2002). These mostly occur in the southern Illinois area (e.g., Pool 26) (Koel et al. 2000), although the grass carp has been collected in Pool 14 (Bowzer and Lippincott 2000). These species can impact native species by destroying habitat, reducing water quality, and by consuming aquatic vegetation (grass carp) or planktonic organisms (silver and bighead carp) (USGS 2003). The silver and bighead carp have the potential to adversely affect every species of fish within the Upper Mississippi River (Chick 2002). The black carp (*Mylopharyngodon piceus*) primarily occurs in aquaculture ponds in Arkansas and Mississippi (Koel et al. 2000). However, it has been collected in the Mississippi River, but is not believed to have established reproducing populations as yet (USGS 2003). This species feeds almost exclusively on mussels and snails, therefore, if it becomes established within the Upper Mississippi River it could further threaten freshwater mussels (USGS 2003).

The staff, while preparing this assessment, assumed that other industrial, commercial, or public installations could be located in the general vicinity of the Quad Cities site prior to the end of Quad Cities Units 1 and 2 operations. The intake of water from, and the discharge of water to, the Upper Mississippi River from these facilities would be regulated by the IEPA, the Wastewater Section of the Iowa Water Quality Bureau, or other agencies, just as the Quad Cities Units 1 and 2 is presently regulated by the IEPA. The intake and discharge limits for each installation are set considering the overall or cumulative impact of all of the other regulated activities in the area. Compliance with the Clean Water Act and NPDES permits minimizes the cumulative effects on aquatic resources. Continued operation of Quad Cities Units 1 and 2 will require renewed discharge permits from the IEPA which will address changing requirements so that cumulative water quality objectives are served. Therefore, the staff concludes that the potential cumulative impacts contributed by the continued operation of Quad Cities Units 1 and 2 will be SMALL, and that no additional mitigation measures are warranted.

#### **4.8.2 Cumulative Impacts Resulting from Continued Operation of the Transmission Lines**

The continued operation of the Quad Cities electrical transmission facilities was evaluated to determine if there is the potential for interactions with other past, present, and future actions that could result in adverse cumulative impacts to terrestrial resources such as wildlife populations, and the size and distribution of habitat areas; and aquatic resources such as wetlands and floodplains. For the purposes of this analysis, the geographic area that encompasses the past, present, and foreseeable future actions that could contribute to adverse cumulative effects is the area within 80 km (50 mi) of the Quad Cities site, as depicted in Figure 2-1.

As described in Section 4.2, the staff found no new and significant information indicating that the conclusions regarding any of the transmission line-related Category 1 issues as related to Quad Cities are inconsistent with the conclusions within the GEIS. The staff anticipates that Exelon, MidAmerican, Alliant and their contractors will follow BMPs for ROW vegetation management over all of its transmission line corridors that are protective of wildlife and habitat resources, including floodplains and wetlands. There are no State or Federally regulated wetlands at the Quad Cities site or within the transmission line right-of-way connecting Quad Cities to the power grid. Therefore, continued operation and maintenance of these ROWs are not likely to contribute to a regional decline in wetland or floodplain resources. Using BMPs for vegetation management ensures minimal disturbance to wildlife and may improve the habitat within the transmission line corridors relative to many of the surrounding land uses.

Based on the expectation that BMPs for protecting Federally listed species and their habitats will be implemented by Exelon, MidAmerican, Alliant and their contractors while carrying out vegetation management activities along transmission lines, it is the staff's determination that the cumulative impacts of the continued operation of the Quad Cities transmission lines will be SMALL, and that no additional mitigation is warranted.

#### **4.8.3 Cumulative Radiological Impacts**

The radiological dose limits for protection of the public and workers have been developed by the EPA and the NRC to address the cumulative impact of acute and long-term exposure to radiation and radioactive material. As described in Section 2.2.7, the public and occupational doses resulting from operation of Quad Cities are within regulatory limits, and as described in Section 4.3, the impacts of these doses are SMALL. For the purposes of this analysis, the area within an 80-km (50-mi) radius of the Quad Cities site was included (Figure 2-1). EPA regulation 40 CFR 190 limits the dose to members of the public from all sources in the nuclear fuel cycle in the United States, including all the nuclear power plants, fuel fabrication facilities, waste disposal facilities, and transport of fuel and waste. In addition, the radiological

environmental monitoring program conducted by Exelon in the vicinity of Quad Cities measures radiation and radioactive material from all sources, including Quad Cities; therefore, the monitoring program measures cumulative radiological impacts. The NRC and the States of Illinois and Iowa would regulate any reasonably foreseeable future actions in the vicinity of Quad Cities that could contribute to cumulative radiological impacts.

Therefore, the staff determined that the cumulative radiological impacts of continued operation of Quad Cities will be **SMALL**, and that no additional mitigation is warranted.

#### **4.8.4 Cumulative Socioeconomic Impacts**

Much of the analyses of socioeconomic impacts presented in Section 4.4 of this SEIS already incorporates cumulative impact analysis because the metrics used for quantification only make sense when placed in the total or cumulative context. For instance, the impact of the total number of additional housing units that may be needed can only be evaluated with respect to the total number that will be available in the impacted area. Therefore, the geographical area of the cumulative analysis varies depending on the particular impact considered, and may depend on specific boundaries, such as taxation jurisdictions or may be distance related, as in the case of Environmental Justice.

The continued operation of Quad Cities is not likely to add to any cumulative socioeconomic impacts beyond those already evaluated in Section 4.4. In other words, the impacts of issues such as transportation or offsite land use are likely to be non-detectable beyond the regions previously evaluated and will quickly decrease with increasing distance from the site. The staff determined that the impacts on housing, public utilities, public services, and environmental justice would be **SMALL**. The staff determined that the impact on off-site land use is **SMALL** because, as no refurbishment actions are planned at Quad Cities, no new incremental sources of plant-related tax payments are expected that could influence land use by fostering considerable growth. There are no reasonably foreseeable scenarios that would alter these conclusions regarding cumulative impacts.

Related to historic resources, no archaeological or historical architectural surveys have been completed for Quad Cities. There are no indications that standing buildings and structures at Quad Cities carry any historical value, however, there are reports of archaeological finds on or in the vicinity of Quad Cities. These reports and the location of the plant on an alluvial terrace of the Mississippi River translate to a high potential for the discovery of archaeological remains during any future ground disturbance that might occur over the period of extended operation under NRC license. The licensee recognizes the potential that archaeological remains may be present in undisturbed areas and at undisturbed depths at Quad Cities, and, given that recognition, management procedures employed by Exelon should protect against damage to important archaeological sites. The NRC staff has concluded that with the company procedure

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requiring additional archaeological review in the event of activities in areas not previously disturbed, and with a commitment of the licensee to contact the Illinois Historic Preservation Agency for direction on level of effort necessary for archaeological survey in such project areas, the impacts of license renewal would be **SMALL**. Under these circumstances there is no reason to believe that the continued operation and maintenance of the Quad Cities site would impact any significant archaeological resources without consideration of those resources, and therefore the contribution to a cumulative impact on historic resources is considered **SMALL**.

### **4.8.5 Cumulative Impacts on Groundwater Use and Quality**

The Quad Cities site is located in the Meredosia Channel, an ancient channel of the Mississippi River. The Meredosia Channel has been filled over many thousands of years with unconsolidated sediments ranging in depth from approximately 15 to 91 m (50 to 300 ft) (Blume 1966). It is expected that these waters communicate strongly with the present channel. The groundwater gradient in this aquifer is relatively flat and generally flows towards the river, except during periods of high river flow (Blume 1966).

There are groundwater withdrawals at Quad Cities, and Exelon imports no other potable water from local utilities for plant use. The impact of current water usage has been determined in Section 4.5 to be **SMALL**. Based on the fact that Exelon has determined that the long term water table levels have not dropped, the Quad Cities site is not causing a detectable change in the regional groundwater usage, nor has the regional water table dropped, and therefore the cumulative impact is **SMALL** and no mitigation measures are warranted.

### **4.8.6 Cumulative Impacts on Threatened or Endangered Species**

The geographic area considered in the analysis of potential cumulative impacts to threatened or endangered species includes Clinton and Scott Counties, Iowa; Lee, Rock Island, and Whiteside Counties, Illinois; and the waters of the Upper Mississippi River, particularly within Pool 14. As discussed in Sections 2.2.5 and 2.2.6, there are several threatened or endangered species that occur within this area. The staff's findings presented in Section 4.6 are that continued operation of Quad Cities Units 1 and 2 would have a **SMALL** effect on these species. The staff's findings were documented in a biological assessment, and forwarded to the FWS for its concurrence in December 2003. The FWS concurred with the staff's biological assessment in a letter dated January 15, 2004 (Nelson 2004). No critical habitat, as designated by the Endangered Species Act, occurs in the area affected by the Quad Cities site; therefore, cumulative impacts on critical habitats are not addressed.

#### 4.8.6.1 Aquatic Species

The only Federally protected aquatic species that occurs in the area of the Quad Cities site is the endangered Higgins' eye pearlymussel (*Lampsilis higginsii*). As mentioned in Section 2.2.5, past actions that have adversely affected the freshwater mussels (including the Higgins' eye pearlymussel) within the Upper Mississippi River have included the pearl button and cultured pearl industries, siltation, chemicals, establishment and maintenance of the navigation channel, commercial and recreational navigation, and introduced species (particularly the zebra mussel). Channel navigation maintenance activities are now routinely coordinated with the FWS and state natural resource agencies in order to minimize or avoid impacting riverine habitat. Nevertheless, in its Biological Opinion for the operation and maintenance of the navigation channel on the Upper Mississippi River (FWS 2000b), the FWS determined that the project (continuation of current operation and maintenance activities for another 50 years) would jeopardize the continued existence of the Higgins' eye pearlymussel. The major adverse effect would be associated with continuing upstream transport of zebra mussels by barge traffic. Currently, there are no effective ways to control established populations of zebra mussels at the scale required to eliminate their threat to the Higgins' eye pearlymussel (FWS 2003). The reintroductions of the endangered mussel into rivers from which it has been extirpated have been conducted since 2000, but it is too early to determine the success of these reintroductions (FWS 2003).

Maintenance activities (e.g., dredging, disposal, clearing and snagging, channel revetments) may affect individuals or populations of the Higgins' eye pearlymussel at a local scale. However, through the Section 7 process of the Endangered Species Act, impacts to the mussel from these activities would be avoided or minimized (FWS 2000b). Similarly, permit requirements under Section 401 and 404 of the Clean Water Act and Section 7 consultation would avoid or minimize future impacts to the Higgins' eye pearlymussel from barge fleetings and port facility developments. Permit requirements and Section 7 consultation would also be required for other developments (e.g., power plants) within the Upper Mississippi River. Therefore, potential impacts to the Higgins' eye pearlymussel from these types of future developments would be small to negligible. For example, MidAmerican Energy relocated a portion of a mussel bed that was located within the proposed outfall area for a 500-megawatt generating facility near Cordova, Illinois. This effort was successful in relocating mussels, including Higgins' eye pearlymussels, allowing the plant to be conducted without adversely impacting the species (MidAmerican Energy Holdings Company 2001). However, other residential, industrial, and recreational activities not requiring Section 7 consultation or water quality permits would be likely to increase in the future, and may alter habitat conditions for the Higgins' eye pearlymussel (FWS 2000b).

As discussed in Section 4.8.1, there is the potential for other non-native species to become established within the Upper Mississippi River in the future. One non-native mussel that could impact the Higgins' eye pearlymussel in the same manner as the zebra mussel is the quagga

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mussel (*Dreissena bugensis*). This species is already established in the lower Great Lakes and has been found in the Upper Mississippi River near St. Louis, Missouri (FWS 2000b). If the black carp becomes established in the Upper Mississippi River, it could pose a threat to the Higgins eye pearl mussel because it feeds upon mussels (Chick 2002).

There are only 10 Essential Habitat Areas for the Higgins' eye pearl mussel within the entire Upper Mississippi River watershed (one in the Wisconsin River, three in the St. Croix River, and six in the Mississippi River) (FWS 2003). Only two of these Essential Habitat Areas, both located in Wisconsin, are located within the 3-m (9-ft) navigation channel (FWS 2000b). One of the Essential Habitat Areas is located 1.6 to 4.0 km (1.0 to 2.5 mi) downstream from the Quad Cities site at Cordova, Illinois. The presence of the Higgins' eye pearl mussel in this area suggests that the operation of Quad Cities Units 1 and 2 has not adversely affected the species. Walleye (which are annually released as part of the fish production operation at the Quad Cities site) is one of several suitable host species for Higgins' eye pearl mussel glochidia (FWS 2003). Thus, the release of walleye may have a small benefit to the mussels that occur downstream from the Quad Cities site. However, the Essential Habitat Area at Cordova, Illinois (as well as the two in Wisconsin that occur within the navigation channel) has become severely infested with zebra mussels (FWS 2003).

### 4.8.6.2 Terrestrial Species

Six Federally listed terrestrial species may occur in the area of the Quad Cities site and its associated transmission lines (Table 2-3). However, five of these species, the Indiana bat, Iowa Pleistocene snail, western and eastern prairie fringed orchids, and the prairie bush-clover, have not been reported from the Quad Cities site or its associated transmission lines. The staff, as a result, determined in Section 4.6 that continued operation of Quad Cities would have no effect on any of these five species. Therefore, the continued operation of Quad Cities will not contribute to a regional cumulative impact on these five federally listed species, regardless of whether or not other actions occur that could have adverse impacts.

The only Federally listed species known to occur near the Quad Cities site and its associated transmission lines is the bald eagle. As mentioned in Section 2.2.6, the increases in the bald eagle population prompted downlisting from Federally-endangered to Federally-threatened status in 1995 and the species is currently proposed for delisting (64 FR 36453 [FWS 1999]). Past actions that have adversely affected the bald eagle include the widespread use of DDT and other organochlorine pesticides shortly after World War II for mosquito control. Eagles ingested dichloro-diphenyl-trichloroethane (DDT) contaminated fish which caused thinning of the shells of their eggs, which in turn resulted in nesting failures. The use of DDT was banned in 1972 by the U.S. Environmental Protection Agency, marking the first major step in the bald eagle recovery. Other past actions adversely impacting the bald eagle include the construction of impoundments and water level regulation (i.e., altering habitats and species composition), extensive logging and agricultural conversion, urban development, dredging, channel structures

and revetments, tow traffic, development of fleeting areas and port facilities, human disturbance (especially during critical nesting periods, March through May for this region) and recreational activities (FWS 2000b).

Prior to the first Europeans arriving on the North American continent, it is estimated that 250,000-500,000 bald eagles were extant in 45 of the 48 contiguous states. The breeding range of the bald eagle was greatly impacted and diminished during the 1800-1900's, with present day breeding primarily occurring in northern California, Alaska, Oregon, Washington, Minnesota, Wisconsin, Michigan, Maine, the Chesapeake Bay area, Florida, the tri-state corner of Idaho, Montana, and Wyoming, and in parts of Canada (FWS 2000a). The lowest estimated nesting pairs for the lower 48 contiguous states occurred in 1963 with 487 counted. Recovery efforts across the states have resulted in this number rising to approximately 6,000 nesting pairs in 1998 and with close to 7,000 young produced (FWS 2000b). The proposal for delisting occurred on July 6, 1999 (64 FR 36453 [FWS 1999]). Specifically, the recovery goal for the northern states recovery region, within which the Quad Cities site and its associated transmission lines occur, is to re-establish a self-sustaining population and to have 1200 occupied breeding areas by the year 2000. This goal was achieved and exceeded with over 2,000 occupied territories in the northern state region in 1998 (FWS 2000b).

The Upper Mississippi River System represents an area of significant winter use for the bald eagle, especially in areas where the river is not frozen over and adequate perch sites are available. These areas provide important and stable feeding areas during periods where high caloric intake is needed (FWS 2000b). As discussed in section 2.2.6, the open water areas in the Mississippi River created by the warm water discharges from Quad Cities represent a feeding area for the bald eagle and the forest bottomlands within the vicinity offer suitable perching sites. It is not surprising that the bald eagle has a known and successful (i.e., in producing young) nesting site upstream of the site, while many bald eagles have been noted and documented to use areas near and in the vicinity of Quad Cities and its transmission lines during winter. The FWS notes that high use areas, during winter, within this northern states region include those areas with heated effluent discharged by power plants (FWS 2000b; Nelson 2003a). Furthermore, it is noted by the FWS (2000b) that during most winters, considerable open water exists for bald eagle use in the region and such habitat is not limiting for this species.

Three habitat components for winter bald eagle management exist and include (1) feeding, (2) daytime perching, and (3) night roost areas. The preferred perching areas are trees within 30 m (100 ft) of the shore (FWS 2000b). The Quad Cities site and some of its transmission lines offer excellent feeding and daytime perching sites (i.e., Rock Island and Davenport transmission lines in particular). Removal or disturbance of roost sites could adversely affect bald eagles, causing them to abandon the use of their wintering areas; protection of these sites is therefore important (FWS 2000b). The staff expects that Exelon, MidAmerican, Alliant, and their vegetation management contractors will work with the FWS and State agencies to ensure



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that any maintenance operations for the transmission lines minimize any adverse impacts on the bald eagle (Cunningham 2003; Exelon 2003d; Exelon 2003e).<sup>(a)</sup>

The staff determined in Section 4.6 that continued operation of Quad Cities is not likely to adversely affect the bald eagle. Maintenance activities (e.g., dredging, disposal, clearing and snagging, channel structures/revetments) may affect the bald eagle locally. However, through the Section 7 process of the Endangered Species Act, impacts to the bald eagle from these activities would be avoided or minimized (FWS 2000b). In addition, the geographic area under this review is largely rural and agricultural with not much opportunity for further timber clearing and agricultural conversion (i.e., it is already predominantly converted to agricultural use). Further urban development would, in all likelihood, impact agricultural areas, as natural areas are protected within the Upper Mississippi River NWFR and the Princeton Wildlife Management Area in the vicinity of Quad Cities Station. Human disturbance, as a consequence, is minimized by their management strategies. Quad Cities is not planning any refurbishment activities in the future and is not aware of other activities in the vicinity of the Quad Cities facility that would contribute to the cumulative impact on the bald eagle.

| Based on the expectation that Exelon, MidAmerican, Alliant and their contractors will implement  
| BMPs for vegetation management and the staff's finding that there will be no adverse impacts  
| on threatened or endangered species during the period of extended operations, the staff has  
determined that the cumulative impacts to threatened or endangered species due to continued  
operation of the Quad Cities site and associated transmission lines would be **SMALL**, and that  
additional mitigation measures would not be warranted.

### 4.8.7 Conclusions Regarding Cumulative Impacts

The staff considered the potential impacts resulting from operation of Quad Cities Units 1 and 2 during the license renewal term and other past, present, and future actions in the Quad Cities area.

| For each impact area, the staff's determination is that the potential cumulative impacts resulting  
from operation during the license renewal term are **SMALL**, and additional mitigation is not  
warranted.

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(a) Personal communication between Ed Britton, District Manager, Savanna District, Upper Mississippi River NWFR, May 8, 2003.

## 4.9 Summary of Impacts of Operations During the Renewal Term

Neither Exelon nor the staff is aware of information that is both new and significant related to any of the applicable Category 1 issues associated with the Quad Cities operation during the renewal term. Consequently, the staff concludes that the environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for 13 Category 2 issues applicable to Quad Cities operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For 12 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of Quad Cities would be of SMALL significance in the context of the standards set forth in the GEIS and that additional mitigation would not be warranted. In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, no evaluation of this issue is required.

For one issue, the staff's conclusion is that the potential environmental impact of renewal term operations of Quad Cities Units 1 and 2 is greater than SMALL. The staff concludes that the impact of the potential for electric shock is MODERATE on the portions of the north Nelson line where calculated induced currents exceed 5 mA. For this issue, consideration of further mitigation by the transmission line owner, Exelon Power Delivery, is recommended.

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10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

36 CFR Part 800. Code of Federal Regulations, Title 36, *Parks, Forest, and Public Property*, Part 800, "Protection of Historic and Cultural Resources."

40 CFR 125. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System (NPDES)."

40 CFR 190. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

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## 5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup> The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristic.
- (2) Single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter describes the environmental impacts from postulated accidents that might occur during the license renewal term.

### 5.1 Postulated Plant Accidents

Two classes of accidents are evaluated in the GEIS. These are design-basis accidents (DBAs) and severe accidents, as discussed below.

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and Addendum 1.

## Postulated Accidents

### 5.1.1 Design-Basis Accidents

In order to receive The NRC approval to operate a nuclear power facility, an applicant must submit a safety analysis report (SAR) as part of the application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

DBAs are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can withstand normal and abnormal transients, and a broad spectrum of postulated accidents without undue hazard to the health and safety of the public. A number of these postulated accidents are not expected to occur during the life of the plant but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in 10 CFR Part 50 and 10 CFR Part 100.

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the operating license (OL). The results of these evaluations are found in license documentation such as the staff's safety evaluation report (SER), the final environmental statement (FES), the licensee's updated final safety analysis report (UFSAR), and Section 5.1 of this supplemental environmental impact statement (SEIS). The licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant, including any extended-life operation. The consequences for these events are evaluated for the hypothetical maximally exposed individual; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of the plant, including the license renewal period. Accordingly, the design of the plant relative to DBAs during the extended period is considered to remain acceptable, and the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, design-basis accidents are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs make them a part of the current licensing basis of the plant; the current licensing basis of the plant is to be maintained by the licensee under its current license

and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal. This issue, applicable to Quad Cities Units 1 and 2, is listed in Table 5-1.

**Table 5-1. Category 1 Issue Applicable to Postulated Accidents During the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
<b>POSTULATED ACCIDENTS</b>	
Design-basis accidents	5.3.2; 5.5.1

Based on information in the GEIS, the Commission found that

The NRC staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.

Exelon Generation Company, LLC (Exelon) stated in its Environmental Report (ER) that it is not aware of any new and significant information associated with the renewal of the Quad Cities Units 1 and 2 OLs (Exelon 2003a). The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of design basis accidents during the renewal term beyond those discussed in the GEIS.

### 5.1.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, whether or not there are serious offsite consequences. The GEIS assessed the impacts of severe accidents during the license renewal period, using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Based on information in the GEIS, the Commission found that

The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to ground water, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

## Postulated Accidents

Therefore, the Commission has designated mitigation of severe accidents as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue, applicable to Quad Cities Units 1 and 2, is listed in Table 5-2.

**Table 5-2. Category 2 Issue Applicable to Postulated Accidents During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Sections</b>	<b>10 CFR 51.53(c)(3)(ii) Subparagraph</b>	<b>SEIS Section</b>
<b>POSTULATED ACCIDENTS</b>			
Severe Accidents	5.3.3; 5.3.3.2; 5.3.3.3; 5.3.3.4; 5.3.3.5; 5.4; 5.5.2	L	5.2

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of severe accidents beyond those discussed in the GEIS. However, in accordance with 10 CFR 51.53(c)(3)(ii)(L), the staff has reviewed severe accident mitigation alternatives (SAMAs) for Quad Cities. The results of the staff's review are discussed in Section 5.2.

## 5.2 Severe Accident Mitigation Alternatives (SAMAs)

10 CFR 51.53(c)(3)(ii)(L) requires that license renewal (LR) applicants consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (i.e., hardware, procedures, and training) with the potential for improving severe-accident safety performance are identified and evaluated. SAMAs have not been previously considered for Quad Cities Units 1 and 2; therefore, the remainder of Chapter 5 addresses those alternatives.

### 5.2.1 Introduction

This section presents a summary of the SAMA evaluation for Quad Cities conducted by Exelon and described in the ER (Exelon 2003a) and of the NRC staff review of that evaluation. The details of the review are described in the NRC staff evaluation that was prepared by the staff with contract assistance from Information Systems Laboratories, Inc. The entire evaluation is presented in Appendix G.

The SAMA evaluation for Quad Cities was a four-step process. In the first step, Exelon quantified the level of risk associated with potential reactor accidents using the plant-specific probabilistic risk assessment and other risk models.

The second step was the examination of the major risk contributors to identify areas where plant improvements might have the greatest chance to reduce risk. Then, possible ways of reducing those risks were identified. Common ways of reducing risk are changes to components, systems, procedures, and training. Exelon identified 280 potential SAMAs. Using a set of screening criteria, the number of SAMAs requiring further consideration was reduced to 54. Preliminary cost estimates were made for these 54 SAMAs, and any SAMAs costing more than the maximum attainable benefit (discussed in Section 5.2.3) were removed from further consideration.

In the third step, the benefits and costs for the remaining 15 candidate SAMAs were estimated. Estimates were made of how much each proposed SAMA could reduce risk. Those estimates were developed in terms of dollars in accordance with The NRC guidance for performing regulatory analyses (NRC 1997). The costs of implementing the proposed SAMAs were also estimated.

Finally in the fourth step, the costs and benefits of each of the 15 final SAMAs were compared to determine whether the SAMA was cost-beneficial, meaning the benefits of the SAMA were greater than the costs (a positive cost-benefit). In the final analysis, Exelon concluded that none of these 280 SAMAs were cost-beneficial for Quad Cities. However, the staff concluded that four SAMAs are cost-beneficial and that two additional SAMAs may be cost-beneficial.

Each of these four steps is discussed in more detail in the sections that follow and in Appendix G.

## 5.2.2 Estimate of Risk

Exelon submitted an assessment of SAMAs for Quad Cities as part of the ER (Exelon 2003a). This assessment was based on the most recent Quad Cities Probabilistic Risk Assessment (PRA) (including the Level 1 and 2 analyses), a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System (MACCS2) (essentially a Level 3 PRA model), and insights from the Quad Cities Individual Plant Examination (IPE) (ComEd 1993) and Individual Plant Examination of External Events (IPEEE) (ComEd 1997). The SAMA analysis is based on the most recent PRA model available at the time of the ER, referred to as the 2002B model (or Update Revision 02B). The baseline core damage frequency (CDF) for Quad Cities is approximately  $2.2 \times 10^{-6}$  per year, based on internally-initiated events. Exelon did not include the contribution to CDF from external events in these estimates even though the risk from external events is significantly higher for Quad Cities than

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the risk from internal events. Although the scope of the Quad Cities PRA does not include external events, Exelon concluded that the existing IPEEE and fire evaluations had adequately identified potential plant improvements to address external events. The breakdown of CDF by initiating event/accident class is summarized in Table 5-3. Loss of the 125-V DC buses, loss of offsite power, transients (such as turbine trip, loss of turbine building closed-cooling water, and loss of condenser vacuum), and loss of service water are the dominant contributors to the CDF.

**Table 5-3. Quad Cities Units 1 and 2 Core Damage Frequency**

Initiating Event/Accident Class	Frequency (CDF) (per Year)	Percent Contribution to the CDF
Loss of 125-V DC Buses 1 and 2	$7.6 \times 10^{-7}$	35
Loss of offsite power (LOOP) <sup>(a)</sup> (dual-unit and single-unit)	$4.2 \times 10^{-7}$	19
Transients	$3.2 \times 10^{-7}$	15
Loss of service water	$3.0 \times 10^{-7}$	14
Loss-of-coolant accident (LOCA)	$1.5 \times 10^{-7}$	7
Loss of instrument air	$6.8 \times 10^{-8}$	3
Manual shutdown	$6.6 \times 10^{-8}$	3
Others	$6.0 \times 10^{-8}$	3
Interfacing systems LOCA (ISLOCA)	$2.3 \times 10^{-8}$	1
Total CDF (from internal events)	$2.2 \times 10^{-6}$	100

(a) Includes station blackout.

Exelon estimated the dose from all postulated accidents to the population within 80 km (50 mi) of the Quad Cities site to be approximately 0.0167 person-Sv (1.67 person-rem). The breakdown of the population dose by containment release mode is summarized in Table 5-4. Early and late containment failures dominate the population dose.

The staff has reviewed Exelon's data and evaluation methods and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for the candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses provided by Exelon.

**Table 5-4. Breakdown of Population Dose by Containment Release Mode**

<b>Containment Release Mode</b>	<b>Population Dose (Person-Rem<sup>(a)</sup> per Year)</b>	<b>Percent Contribution to Dose</b>
Early containment failure	0.93	56
Late containment failure	0.67	40
Containment bypass	0.07	4
No containment failure	-0	-0
<b>Total Population Dose</b>	<b>1.67</b>	<b>100</b>

(a) One person-rem equals 0.01 person-Sv.

### 5.2.3 Potential Plant Improvements

Once the most risk significant parts of the plant design and operation were identified, Exelon searched for ways to reduce those risks. To identify potential plant improvements, Exelon reviewed improvements identified in the Quad Cities IPE and IPEEE and subsequent PRA revision processes, SAMA analyses submitted for other nuclear power plants, and The NRC and industry documents discussing potential plant improvements. Exelon identified 280 potential risk-reducing improvements to plant components, systems, procedures, and training (SAMAs).

All but 54 of these SAMAs were removed from further consideration because: (1) the SAMA was not applicable at Quad Cities due to design differences, (2) the SAMA had already been implemented at Quad Cities, (3) the SAMA was sufficiently similar to other SAMAs and was combined with another SAMA, or (4) the SAMA would not provide a significant safety benefit or has implementation costs greater than any possible risk benefit. A preliminary cost estimate was prepared for each of the remaining 54 SAMAs.

The preliminary cost estimate of each of the 54 remaining SAMAs was compared to the maximum attainable benefit (MAB) of \$110,000. The MAB is the dollar value of the benefit that would be achieved if the plant risk and population dose from postulated accidents could be reduced to zero. If the cost of a SAMA exceeded the MAB, it could not be cost-beneficial because no single SAMA could eliminate all the risk. Using this comparison, all but 15 of the candidate SAMAs were removed from further consideration. The ER only identified 14 candidate SAMAs for further examination because of an error. This error was identified and corrected in Exelon's response to an NRC staff request for additional information (RAI) (Exelon 2003b).



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The staff reviewed Exelon's screening methods and results and concluded that they were systematic and comprehensive.

### 5.2.4 Evaluation of Risk Reduction and Costs of Improvements

Exelon evaluated the risk reduction potential of the remaining 15 SAMAs. Bounding calculations were made for most of these SAMAs; bounding calculations overestimate the benefit and are conservative. The benefits (the estimated dollar value of these risk reductions) were developed by calculating and adding the averted public exposure, offsite property damage, occupational exposure, and onsite costs associated with each SAMA (Exelon 2003a).

The staff reviewed Exelon's bases for calculating the risk reduction for the various plant improvements and concluded that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative. Therefore, the staff based its estimates of averted risk for the various SAMAs on Exelon's risk reduction estimates. However, the staff concluded that the benefit estimates should be increased by a factor of ten (Exelon used a factor of five) to fully account for the potential impacts of uncertainties and external events, especially fires.

The staff reviewed the cost estimates and concluded that the cost ranges provided by Exelon were reasonable and appropriate for use in the SAMA evaluation. However, the staff concluded that the cost estimates at the lower end of the cost ranges provided by Exelon were more appropriate than the values used by Exelon in the cost-benefit comparisons for two SAMAs. These two SAMAs are SAMA 6, develop procedures for locally starting equipment during a 125 V DC bus failure; and SAMA 8, develop procedures to control feedwater flow without 125-V DC power. These conclusions contributed to the staff's conclusions regarding cost-beneficial SAMAs (see Section 5.2.5).

### 5.2.5 Cost-Benefit Comparison

Based on the more detailed evaluations of potential risk reduction and cost discussed above, Exelon determined that none of the 15 remaining SAMAs were cost-beneficial. In response to the staff's RAIs (NRC 2003), Exelon evaluated the level of uncertainty in the calculations. Since the Quad Cities PRA did not include uncertainty analyses, Exelon used information from the uncertainty analyses performed for the LaSalle plant (another Exelon boiling water reactor plant) to estimate 95<sup>th</sup> percentile values of the CDF for Quad Cities. Use of these 95<sup>th</sup> percentile CDF values increased the estimated benefits of the SAMAs by approximately a factor of five. Exelon revisited the set of SAMAs screened out in the first part of the evaluation using the 95<sup>th</sup> percentile CDF values to account for the potential impact of external events and uncertainties. Exelon identified two additional SAMAs that could be cost-beneficial using the 95<sup>th</sup> percentile values of the CDF. However, all 17 SAMAs were found by Exelon to have implementation costs greater than their averted cost-risk (benefit), and thus, were eliminated

from further consideration. Therefore, Exelon's final conclusion was that there were no cost-beneficial SAMAs (Exelon 2003b).

The staff reviewed Exelon's calculation methods and logic arguments in the final cost-benefit comparisons and concluded that Exelon's original benefit estimates should be increased by a factor of 10 to fully account for the potential impact of uncertainties and external events, especially fires. As a result, the staff concluded that four SAMAs were cost-beneficial: SAMA 6, develop procedures for locally starting equipment during a 125-V DC bus failure; SAMA 8, develop procedures to control feedwater flow without 125-V DC power; SAMA 10, develop procedures to terminate reactor depressurization at a high enough pressure to keep the reactor core isolation cooling system operable; and SAMA 14, develop procedures to control containment venting within a narrow band of pressure. The staff concluded that two additional SAMAs could be cost-beneficial if a more detailed evaluation of the external events benefits or the uncertainties were performed: SAMA 1, develop procedures to provide alternate safe shutdown makeup pump room cooling; and SAMA 2, develop procedures to use the fire protection system as a source of water for the drywell spray system. The numbered SAMAs (1 through 17) are the 17 SAMAs that were included in the final cost-benefit analysis after Exelon increased the benefit estimates by a factor of five in response to staff RAIs.

## 5.2.6 Conclusions

The staff reviewed the Exelon SAMA analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Exelon are reasonable and sufficient for the license renewal submittal. However, the staff concluded that four SAMAs were cost-beneficial: SAMA 6, develop procedures for locally starting equipment during a 125-V DC bus failure; SAMA 8, develop procedures to control feedwater flow without 125-V DC power; SAMA 10, develop procedures to terminate reactor depressurization at a high enough pressure to keep the reactor core isolation cooling system operable; and SAMA 14, develop procedures to control containment venting within a narrow band of pressure. The staff concluded that two additional SAMAs could be cost-beneficial if a more detailed evaluation of the external events benefits or the uncertainties were performed: SAMA 1, develop procedures to provide alternate safe shutdown makeup pump room cooling; and SAMA 2, develop procedures to use the fire protection system as a source of water for the drywell spray system. However, none of the six SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

The staff concludes that none of the other candidate SAMAs are cost-beneficial. This conclusion is consistent with the low residual level of risk indicated in the Quad Cities PRA and

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the fact that Quad Cities has already implemented many plant improvements identified from the IPE and IPEEE process.

### 5.3 References

- | 10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."
- | 10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
- | 10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
- | 10 CFR Part 100. Code of Federal Regulations, Title 10, *Energy*, Part 100, "Reactor Site Criteria."
- | Commonwealth Edison Company (ComEd). 1993. Letter from Martin J. Vonk, Commonwealth Edison Company, to Thomas E. Murley, U.S. Nuclear Regulatory Commission. Subject: "Quad Cities Nuclear Power Station Units 1 and 2 Individual Plant Examination Submittal." December 13, 1993.
- | Commonwealth Edison Company (ComEd). 1997. Letter from E. S. Kraft, Commonwealth Edison Company, to U.S. Nuclear Regulatory Commission Document Control Desk. Subject: Quad Cities Nuclear Power Station Units 1 and 2 Final Report—Individual Plant Examination of External Events (IPEEE) Generic Letter 88-20, Supplement 4. February 17, 1997.
- | Exelon Generation Company, LLC (Exelon). 2003a. *Applicant's Environmental Report—Operating License Renewal Stage, Quad Cities Nuclear Power Station Units 1 and 2*. License Nos. DPR-29 and DPR-30. Exelon Generation Company, LLC. Warrenville, Illinois. January 2003.
- | Exelon Generation Company, LLC (Exelon). 2003b. Letter from Jeffrey A. Benjamin, Exelon, to U.S. Nuclear Regulatory Commission. Subject: Quad Cities Nuclear Power Station, Units 1 and 2, Facility Operating License Nos. DPR-29 and DPR-30, NRC Docket Nos. 50-254 and 50-265, Response to Request for Additional Information—License Renewal Environmental Report for Quad Cities Nuclear Power Station, Units 1 and 2. July 17, 2003.
- | U.S. Nuclear Regulatory Commission. 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C., 1996.

U.S. Nuclear Regulatory Commission. 1997. *Regulatory Analysis Technical Evaluation Handbook*. NUREG/BR-0184, Washington, D.C. |

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*, "Section 6.3—Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C., 1999.

U.S. Nuclear Regulatory Commission (NRC). 2003. Letter from Louis L. Wheeler, U.S. Nuclear Regulatory Commission, to John Skolds, Exelon. Subject: Request for Additional Information (RAI) Related to the Staff's Review of the License Renewal Environmental Report for the Quad Cities Nuclear Power Station, Unit 1 and 2 (TAC Nos. MB6845 and MB6846). May 23, 2003. |

## **6.0 Environmental Impacts of the Uranium Fuel Cycle and Solid-Waste Management**

Environmental issues associated with the uranium fuel cycle and solid-waste management are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup> The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues that are related to the uranium fuel cycle and solid-waste management during the license renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B and are applicable to Quad Cities Units 1 and 2. The generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based, in part, on the generic impacts provided in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR 51.52(c), Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

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Reactor.” The staff also addresses the impacts from radon-222 and technetium-99 in the GEIS.

### 6.1 The Uranium Fuel Cycle

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to Quad Cities Units 1 and 2 from the uranium fuel cycle and solid-waste management are listed in Table 6-1.

**Table 6-1. Category 1 Issues Applicable to the Uranium Fuel Cycle and Solid-Waste Management During the Renewal Term**

<b>ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1</b>	<b>GEIS Section</b>
<b>URANIUM FUEL CYCLE AND WASTE MANAGEMENT</b>	
Off-site radiological impacts (individual effects from other than the disposal of spent fuel and high level waste)	6.1; 6.2.1; 6.2.2.1; 6.2.2.3; 6.2.3; 6.2.4; 6.6
Off-site radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Off-site radiological impacts (spent fuel and high level waste disposal)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Nonradiological impacts of the uranium fuel cycle	6.1; 6.2.2.6; 6.2.2.7; 6.2.2.8; 6.2.2.9; 6.2.3; 6.2.4; 6.6
Low-level waste storage and disposal	6.1; 6.2.2.2; 6.4.2; 6.4.3; 6.4.3.1; 6.4.3.2; 6.4.3.3; 6.4.4; 6.4.4.1; 6.4.4.2; 6.4.4.3; 6.4.4.4; 6.4.4.5; 6.4.4.5.1; 6.4.4.5.2; 6.4.4.5.3; 6.4.4.5.4; 6.4.4.6; 6.6
Mixed waste storage and disposal	6.4.5.1; 6.4.5.2; 6.4.5.3; 6.4.5.4; 6.4.5.5; 6.4.5.6; 6.4.5.6.1; 6.4.5.6.2; 6.4.5.6.3; 6.4.5.6.4; 6.6
On-site spent fuel	6.1; 6.4.6; 6.4.6.1; 6.4.6.2; 6.4.6.3; 6.4.6.4; 6.4.6.5; 6.4.6.6; 6.4.6.7; 6.6
Nonradiological waste	6.1; 6.5; 6.5.1; 6.5.2; 6.5.3; 6.6
Transportation	6.1; 6.3.1; 6.3.2.3; 6.3.3; 6.3.4; 6.6; Addendum 1

Exelon Generation Company, LLC (Exelon) stated in its Environmental Report (ER) that it is not aware of any new and significant information associated with the renewal of the Quad Cities

Units 1 and 2 operating license (Exelon 2003). The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the staff concluded in the GEIS that the impacts are SMALL except for the collective off-site radiological impacts from the fuel cycle and from HLW and spent fuel disposal, as discussed below, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff review and the GEIS conclusions, as codified in Table B-1, 10 CFR 51, for each of these issues follows:

- Off-site radiological impacts (individual effects from other than the disposal of spent fuel and high level waste). Based on information in the GEIS, the Commission found that

Off-site impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part [10 CFR 51.51(b)]. Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases including radon-222 and technetium-99 are small.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no off-site radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Off-site radiological impacts (collective effects). Based on information in the GEIS, the Commission found that

The 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about 14,800 person rem [148 person Sv], or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful. However, these

assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits and even smaller fractions of natural background exposure to the same populations.

Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA [National Environmental Policy Act] implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no off-site radiological impacts (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Off-site radiological impacts (spent fuel and high level waste disposal). Based on information in the GEIS, the Commission found that

For the high level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for off-site releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 100 millirem [1 mSv] per year or less. However, while the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 100 millirem [1 mSv] per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 100 millirem [1



mSv] per year. The lifetime individual risk from 100 millirem [1 mSv] annual dose limit is about  $3 \times 10^{-3}$ .

Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980 [DOE 1980]. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other Federal agencies have expended considerable effort to develop models for the design and for the licensing of a HLW repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, EPA's generic repository standards in 40 CFR Part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR Part 191 protect the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. Reporting performance standards that will be required by EPA are expected to result in releases and associated health consequences in the range between 10 and 100 premature cancer deaths with an upper limit of 1,000 premature cancer deaths world-wide for a 100,000 metric tonne (MT) repository.

Nevertheless, despite all the uncertainty, some judgement as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgement in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of

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significance for the impacts of spent fuel and HLW disposal, this issue is considered Category 1.

Since the GEIS was originally issued in 1996, the U.S. Environmental Protection Agency (EPA) has published radiation-protection standards for Yucca Mountain, Nevada, at 40 CFR Part 197, "Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada," on June 13, 2001 (66 FR 32074 [EPA 2001]). The Energy Policy Act of 1992 (42 USC 10101 et seq.) directs that the NRC adopt these standards into its regulations for reviewing and licensing the repository. The NRC published its regulations at 10 CFR Part 63 on November 2, 2001 (66 FR 55792 [NRC 2001]). These standards include the following: (1) 0.15-mSv/yr (15-mrem/yr) dose limit for members of the public during the storage period prior to repository closure; (2) 0.15-mSv/yr (15-mrem/yr) dose limit for the reasonably maximally exposed individual for 10,000 years following disposal; (3) 0.15-mSv/yr (15-mrem/yr) dose limit for the reasonably maximally exposed individual as a result of a human intrusion at or before 10,000 years after disposal; and (4) a groundwater-protection standard that states for 10,000 years of undisturbed performance after disposal, radioactivity in a representative volume of groundwater will not exceed (a) 0.19 Bq/L (5 pCi/L) (radium-226 and radium-228), (b) 0.56 Bq/L (15 pCi/L) (gross alpha activity), and (c) 0.04 mSv/yr (4 mrem/yr) to the whole body or any organ (from combined beta- and photon-emitting radionuclides).

On February 15, 2002, subsequent to the receipt of a recommendation by Secretary Abraham, U.S. Department of Energy, the President recommended the Yucca Mountain site for the development of a repository for the geologic disposal of spent nuclear fuel and high-level nuclear waste. The U.S. Congress approved this recommendation on July 9, 2002. On July 23, 2002, the President signed into law House Joint Resolution 87 designating Yucca Mountain as the repository for spent nuclear waste. These developments do not represent new and significant information with respect to the off-site radiological impacts related to spent fuel and HLW disposal during the renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no off-site radiological impacts related to spent fuel and HLW disposal during the renewal term beyond those discussed in the GEIS.

- Nonradiological impacts of the uranium fuel cycle. Based on information in the GEIS, the Commission found that

The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no nonradiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Low-level waste storage and disposal. Based on information in the GEIS, the Commission found that

The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional on-site land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small. Nonradiological impacts on air and water will be negligible. The radiological and nonradiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with the NRC decommissioning requirements.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of low-level waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- Mixed waste storage and disposal. Based on information in the GEIS, the Commission found that

The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and nonradiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with the NRC decommissioning requirements.

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The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of mixed-waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- **On-site spent fuel.** Based on information in the GEIS, the Commission found that

The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of onsite spent fuel associated with license renewal beyond those discussed in the GEIS.

- **Nonradiological waste.** Based on information in the GEIS, the Commission found that

No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

- **Transportation.** Based on information contained in the GEIS, the Commission found that

The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by the NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting HLW to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52(c), Summary Table S-4 – Environmental Impact of Transportation of Fuel and Waste to and from One

**Light-Water-Cooled Nuclear Power Reactor.** If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in § 51.52.

Quad Cities meets the fuel-enrichment and burnup conditions set forth in Addendum 1 to the GEIS. The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003a), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

There are no Category 2 issues for the uranium fuel cycle and solid-waste management.

## 6.2 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR Part 63. Code of Federal Regulations, Title 10, *Energy*, Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada."

40 CFR Part 191. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste."

40 CFR Part 197. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 197, "Public Health and Environmental Radiation Protection Standards for Management and Disposal for Yucca Mountain, Nevada."

Energy Policy Act of 1992. 42 USC 10101, et seq. Public Law 102-486.

Exelon Generation Company, LLC (Exelon). 2003. *Applicant's Environmental Report—Operating License Renewal Stage, Quad Cities Nuclear Power Station Units 1 and 2*. Docket Nos. 50-254 and 50-265. Warrenville, Illinois.

## Fuel Cycle

National Academy of Sciences (NAS). 1995. *Technical Bases for Yucca Mountain Standards*. Washington, D.C.

National Environmental Policy Act of 1969 , as amended (NEPA). 42 USC 4321, et seq.

U.S. Department of Energy (DOE). 1980. *Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste*. DOE/EIS-0046F, Washington, D.C.

U.S. Environmental Protection Agency (EPA). 2001. " Public Health and Environmental Radiation Protection Standards for Yucca Mountain, Nevada." *Federal Register*. Vol. 66, No. 114, pp. 32132–32135. June 13, 2001.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*, " Section 6.3–Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2001. " Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada." *Federal Register*. Vol. 66, No. 213, pp. 55792–55815. November 2, 2001.

## 7.0 Environmental Impacts of Decommissioning

Environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license are evaluated in the *Generic Environmental Impact Statement for Decommissioning of Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors*, NUREG-0586 (NRC 2002). The staff's evaluation of the environmental impacts of decommissioning presented in Supplement 1 resulted in a range of impacts for each environmental issue. These results may be used by licensees as a starting point for a plant-specific evaluation of the decommissioning impacts at their facilities.

The incremental environmental impacts associated with decommissioning activities resulting from continued plant operation during the renewal term are evaluated in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup> The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

## Environmental Impacts of Decommissioning

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required. There are no Category 2 issues related to decommissioning.

### 7.1 Decommissioning

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B that are applicable to Quad Cities Units 1 and 2 decommissioning following the renewal term are listed in Table 7-1. Exelon Generation Company (Exelon) stated in its Environmental Report (ER) that it is not aware of any new and significant information regarding the environmental impacts of Quad Cities Units 1 and 2 license renewal (Exelon 2003). The staff has not identified any new and significant information during the staff's independent review of the Exelon ER, the scoping process, the staff's site visit, the evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues, the staff concluded in the GEIS that the impacts are SMALL and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

**Table 7-1. Category 1 Issues Applicable to the Decommissioning of Quad Cities Units 1 and 2 Following the Renewal Term**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
<b>DECOMMISSIONING</b>	
Radiation doses	7.3.1; 7.4
Waste management	7.3.2; 7.4
Air quality	7.3.3; 7.4
Water quality	7.3.4; 7.4
Ecological resources	7.3.5; 7.4
Socioeconomic impacts	7.3.7; 7.4

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of the issues follows:

- Radiation doses. Based on information in the GEIS, the Commission found that

Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no



more than 1 man-rem [0.01 person-Sv] caused by buildup of long-lived radionuclides during the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no radiation doses associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- **Waste management.** Based on information in the GEIS, the Commission found that

Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts of solid waste associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- **Air quality.** Based on information in the GEIS, the Commission found that

Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no air quality impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- **Water quality.** Based on information in the GEIS, the Commission found that

The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.

## Environmental Impacts of Decommissioning

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no water quality impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- **Ecological resources.** Based on information in the GEIS, the Commission found that

Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no impacts on ecological resources associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- **Socioeconomic impacts.** Based on information in the GEIS, the Commission found that

Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

The staff has not identified any new and significant information during the staff's independent review of the Quad Cities ER (Exelon 2003), the scoping process, the staff's site visit, the staff's evaluation of other available information, and public comments on the draft SEIS. Therefore, the staff concludes that there are no socioeconomic impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

## 7.2 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

Exelon Generation Company (Exelon). 2003. *Applicant's Environmental Report—Operating License Renewal Stage Quad Cities Nuclear Power Station Units 1 and 2*. Docket Nos. 50-254 and 50-265. Warrenville, Illinois.

## Environmental Impacts of Decommissioning

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*, "Section 6.3 – Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2002. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors*. NUREG-0586, Volumes 1 and 2, Washington, D.C. |

## 8.0 Environmental Impacts of Alternatives to Operating-License Renewal

This chapter examines the potential environmental impacts associated with denying the renewal of the operating license (OLs) (i.e., the no-action alternative); the potential environmental impacts from electricity-generating sources other than Quad Cities Units 1 and 2; the possibility of purchasing electric power from other sources to replace power generated by Quad Cities Units 1 and 2 and the associated environmental impacts; the potential environmental impacts from a combination of generating and conservation measures; and other generation alternatives that were deemed unsuitable for replacement of the power generated by Quad Cities Units 1 and 2. The environmental impacts are evaluated using the U.S. Nuclear Regulatory Commission's (NRC's) three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines and set forth in a footnote to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

**SMALL** – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

**MODERATE** – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

**LARGE** – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The impact categories evaluated in this chapter are the same as those used in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) NUREG-1437, Volumes 1 and 2 (NRC 1996; NRC 1999)*,<sup>(a)</sup> with the additional impact category of environmental justice.

### 8.1 No-Action Alternative

The NRC's regulations implementing the National Environmental Policy Act (NEPA) specify that the no-action alternative be discussed in an NRC environmental impact statement (EIS) (10 CFR Part 51, Subpart A, Appendix A[4]). For license renewal, the no-action alternative refers to a scenario in which the NRC would not renew the OLs for Quad Cities Units 1 and 2

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

## Alternatives

and the Exelon Generation Company (Exelon) would then decommission Quad Cities Units 1 and 2 when plant operations cease.

The no-action alternative is a conceptual alternative resulting in a net reduction in electricity generation; there would be no replacement power and, therefore, no environmental impacts from replacement power. In actual practice, the power lost by not renewing the OLS for Quad Cities Units 1 and 2 would likely be replaced by (1) demand-side management (DSM) and energy conservation, (2) electricity generated from other sources, either by Exelon or by another generator, or (3) some combination of these alternatives. Any replacement power would produce environmental impacts in addition to those discussed under the no-action alternative. Environmental impacts of these other sources are discussed in Section 8.

Exelon will be required to comply with the NRC decommissioning requirements whether or not the OLS are renewed and, therefore, must comply under the no-action alternative. If the OLS for Quad Cities Units 1 and 2 are renewed, decommissioning activities would be postponed for up to an additional 20 years. If the OLS are not renewed, Exelon would conduct decommissioning activities according to the requirements in 10 CFR 50.82.

The environmental impacts associated with decommissioning under both license renewal and the no-action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS (NRC 1996), Chapter 7 of this supplemental environmental impact statement (SEIS), and NUREG-0586, Supplement 1, *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors*, dated November 2002 (NRC 2002). The impacts of decommissioning after 60 years of operation are not expected to be significantly different from those occurring after 40 years of operation.

The environmental impacts associated with the no-action alternative are summarized in Table 8-1. Implementation of the no-action alternative would also have certain positive impacts in that adverse environmental impacts associated with the current operation of Quad Cities Units 1 and 2, for example, any adverse ecological impacts, would be eliminated.

**Table 8-1. Summary of Environmental Impacts of the No-Action Alternative**

<b>Impact Category</b>	<b>Impact</b>	<b>Comment</b>
Land Use	SMALL	Impacts would be expected to be temporary.
Ecology	SMALL	Impacts on ecology would be expected to be temporary and largely mitigated by using best management practices.
Water Quality	SMALL	Water use would decrease. Water quality unlikely to be adversely affected.
Air Quality	SMALL	Greatest impact would likely to be from fugitive dust; impact could be mitigated by best management practices.
Waste	SMALL	Low-level radioactive waste would be disposed of in licensed facilities. A permanent disposal facility for high-level waste is currently not available.
Human Health	SMALL	Radiological doses to workers and members of the public would be expected to be within regulatory limits and comparable to, or lower than, doses from operating plants. Occupational injuries would be possible, but injury rates at nuclear power plants are below the U.S. average industrial rate.
Socioeconomic	SMALL	Proximity to the Quad Cities metropolitan area would mitigate any impacts on employment. Small impacts on local tax revenue.
Aesthetics	SMALL	Positive impact from eventual removal of buildings and structures. Some noise impact during decommissioning operations.
Historic and Archaeological Resources	SMALL	Any impacts primarily confined to land use during plant operations. No impact on other lands on site.
Environmental Justice	SMALL	Impacts on minority and low-income communities would be similar to those experienced by the population as a whole.

• **Land Use**

Temporary changes in onsite land use for portions of the site could occur during decommissioning. Temporary changes may include addition or expansion of staging and lay down areas or construction of temporary buildings and parking areas. No offsite land use changes are expected as a result of decommissioning.<sup>(a)</sup> The impacts of the no-action alternative on land use are considered SMALL.

(a) The Rock Island County Land Use Plan designates the site area as industrial, which will have implications for the future use of the site (Rock Island County Land Use Plan, 1998).

## Alternatives

- **Ecology**

Impacts on aquatic ecology at the Quad Cities site could result from removal of in-water pipes and structures or the filling of the intake and discharge canals. Negative impacts to aquatic ecology would likely be short-term and could be mitigated. The aquatic environment is expected to recover naturally. In the long term, decommissioning of Quad Cities Units 1 and 2 would shut down the open-cycle cooling system, with beneficial effects for aquatic biology. However, this no action alternative would result in the loss of the warm water effluent and, during winter, this area may no longer offer open water habitat to support bald eagle feeding with which bald eagles have been noted to use at the Quad Cities site.<sup>(a)</sup> Also, impacts on terrestrial ecology could occur as a result of land disturbance for additional lay down yards, stockpiles, and support facilities. Land disturbance is expected to be minimal and result in relatively short-term impacts that can be mitigated using best management practices (BMPs). The land is expected to recover naturally. The impacts of the no-action alternative on ecology are considered **SMALL**.

- **Water Use and Quality**

The existing plant uses open-cycle cooling. Cessation of plant operations will reduce the cooling water needed and the condenser heat load sent to the river would be eliminated. As plant staff size decreases, the demand for potable water is expected also to decrease. Overall, the impacts of the no-action alternative on water use and quality are considered **SMALL**.

- **Air Quality**

Decommissioning activities that can adversely affect air quality include dismantlement of systems and equipment, demolition of buildings and structures, and the operation of internal combustion engines. The most likely adverse impact would be the generation of fugitive dust. BMPs, such as seeding and wetting, could be used to minimize the generation of fugitive dust. Overall, the impacts of the no-action alternative on air quality are considered **SMALL**.

- **Waste**

Decommissioning activities would result in the generation of radioactive and nonradioactive waste. The volume of low-level radioactive waste could vary greatly depending on the option chosen for decommissioning, and the waste treatment and volume reduction

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(a) Personal communication with E. Bretton, District Manager, Savanna District, Upper Mississippi National Wildlife and Fish Refuge, May 8, 2003.

procedures used. Low-level radioactive waste must be disposed of in a facility licensed by the NRC or a State with authority delegated by the NRC. Recent advances in volume reduction and waste processing have significantly reduced waste volumes.

A permanent repository for high-level waste (HLW) is not currently available. The NRC has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor in its spent fuel pool or at either onsite or offsite independent spent fuel storage installations (10 CFR 51.23[a]). Overall, the impacts of the no-action alternative on waste are considered SMALL.

- **Socioeconomics**

If Quad Cities Units 1 and 2 cease operation, there will be a decrease in employment and possibly tax revenues associated with the closure. These impacts would be most concentrated in Rock Island and Whiteside counties, Illinois, and Scott County, Iowa, with smaller impacts in adjoining counties. There would be some adverse impacts on local housing values and the local economy in Rock Island County, and adjoining counties to a lesser extent, under the no-action alternative.

The tax revenue losses that might result from closure of Quad Cities Units 1 and 2 would occur in Rock Island County and its taxing bodies at the township. Annual property taxes from Quad Cities Units 1 and 2 accounted for approximately 2.7 percent of Rock Island County's total levee extension and approximately 2.8 percent of the county's total collections available for the distribution for the years 1997 to 2000. However, the local Cordova taxing districts for the township, library, school district, road and bridge district, and fire department derive significant revenue (31 to 73 percent of their total revenue from all sources) from the plant (Rock Island County Board of Review 2002). Exelon plans to negotiate a graduated reduction in payments to minimize the financial disruption to county and local operations caused by a change in the methods of plant value assessment due to the deregulation of the utility industry in the State of Illinois (Exelon 2003a). The local taxing districts that rely on the plant for a large portion of their revenue will be adversely affected to a significant degree by the decline in tax receipts.

The no-action alternative would result in the loss of plant payrolls 20 years earlier than if the OLs were renewed. Quad Cities Units 1 and 2 currently support approximately 850 permanent employees and approximately 130 contract workers (Exelon 2003a). Approximately 77 percent of employees who work at the Quad Cities site live in Rock Island and Whiteside counties, Illinois, or in Scott County, Iowa (Exelon 2003a). Therefore, primary employment impacts would be concentrated in these counties. However, the proximity to the Quad Cities metropolitan area would mitigate much of the employment



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impact. Most secondary employment impacts and impacts on population would also be concentrated in Rock Island, Whiteside, and Scott counties. Exelon employees working at the Quad Cities site currently contribute time and money toward community involvement, including schools, churches, charities, and other civic activities. It is likely that with a reduced presence in the community following decommissioning, Exelon's community involvement efforts in the region would be lessened. Overall, the staff concluded that the socioeconomic impacts associated with the no-action alternative are considered **SMALL**.

- **Human Health**

Radiological doses to occupational workers during decommissioning activities are estimated to average approximately 5 percent of the dose limits in 10 CFR Part 20, and to be similar to, or lower than, the doses received from operating nuclear power plants. Occupational injuries to workers engaged in decommissioning activities are possible. Overall, the impacts of the no-action alternative on human health are considered **SMALL**.

- **Aesthetics**

Decommissioning would result in the eventual dismantlement of buildings and structures at the site resulting in a positive aesthetic impact. Noise would be generated during decommissioning operations that may be detectable offsite; however, the impact is unlikely to be of significance, and noise would cease altogether following decommissioning. Overall, the impacts of the no-action alternative on aesthetics are considered **SMALL**.

- **Historic and Archaeological Resources**

Use of land resources at Quad Cities would be reduced following plant closure. Reduced use of the property will reduce the likelihood of adversely impacting historic and archaeological resources. The amount of undisturbed land needed to support the decommissioning process will be relatively small. The staff concluded in NRC (2002) that decommissioning activities conducted within the operational areas of a nuclear power plant are not expected to have a detectable effect on important cultural resources because these areas have been impacted during the operating life of the plant. Minimal disturbance of land outside the licensee's operational area for decommissioning activities is expected. Historic and archaeological resources on undisturbed portions of the site should not be adversely affected. Following decommissioning, the site would likely be retained by Exelon for other corporate purposes. Eventual sale or transfer of the site, however, could result in adverse impacts to cultural resources if the land-use pattern changes dramatically. Notwithstanding this possibility, the impacts of the no-action alternative and decommissioning on historic and archaeological resources are considered **SMALL**.

- **Environmental Justice**

Current operations at the Quad Cities site have no disproportionate impacts on the minority and low-income populations of the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Closure of Quad Cities Units 1 and 2 would result in decreased employment opportunities in Rock Island County, Whiteside County, and Scott County, and somewhat reduced tax revenues in Rock Island County, with possible small, negative and disproportionate impacts on minority or low-income populations. Because the Quad Cities site is located in the Quad Cities metropolitan area, the impacts of closure on minority and low-income populations would be offset by other local employment opportunities. Overall, the impacts of the no-action alternative on minority and low-income populations are considered **SMALL**.

## **8.2 Alternative Energy Sources**

This section discusses the environmental impacts associated with alternative sources of electricity to replace the electricity generated by Quad Cities Units 1 and 2, assuming that the OLs for Units 1 and 2 are not renewed. According to Exelon, the capacity of Quad Cities Units 1 and 2 is approximately 1860 megawatts electric (MW[e]), based on a capacity of 930 MW(e) for each unit. (Exelon 2003a).<sup>(a)</sup>

The order of presentation of alternative energy sources in Section 8.2 does not imply which alternative would be most likely to occur or to have the least environmental impacts. The following generation alternatives are considered in detail:

- coal-fired generation at the Quad Cities site and at an alternate site (Section 8.2.1)
- natural gas-fired generation at the Quad Cities site and at an alternate site (Section 8.2.2)
- nuclear generation at the Quad Cities site and at an alternate site (Section 8.2.3)

The alternative of purchasing power from other sources to replace power generated at Quad Cities Units 1 and 2 is discussed in Section 8.2.4. Other power-generation alternatives and conservation alternatives considered by the staff and found not to be reasonable replacements for the full production at Quad Cities Units 1 and 2 are discussed in Section 8.2.5.

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(a) The Department of Energy's (DOE's) Energy Information Administration (EIA) estimates the peak summer capacity of Quad Cities Units 1 and 2 to be 1537 MW(e) (DOE/EIA 2003c). For the remainder of this section, the staff considered the total capacity of Quad Cities Units 1 and 2 to be 1860 MW(e).

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Section 8.2.6 discusses the environmental impacts of a combination of generation and conservation alternatives.

Each year, the Energy Information Administration (EIA), a component of the U.S. DOE, issues an Annual Energy Outlook. The *Annual Energy Outlook 2002 with Projections to 2020* was issued in December 2001 (DOE/EIA 2001a). In this report, the EIA projects that combined-cycle<sup>(a)</sup> or combustion-turbine technology fueled by natural gas is likely to account for approximately 88 percent of new electricity-generating capacity through the year 2020 (DOE/EIA 2001a). Both technologies are designed primarily to supply peak and intermediate capacity, but combined-cycle technology can also be used to meet base-load<sup>(b)</sup> requirements. Coal-fired plants are projected by the EIA to account for approximately 9 percent of new capacity during this period. Coal-fired plants are generally used to meet base-load requirements. Renewable energy sources, primarily wind, geothermal, and municipal solid-waste units, are projected by the EIA to account for the remaining 3 percent of capacity additions.

The EIA projects that oil-fired plants will account for very little new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). The EIA's projections are based on the assumption that providers of new generating capacity will seek to minimize cost while meeting applicable environmental requirements. Combined-cycle plants are projected by the EIA to have the lowest generation cost in 2005 and 2020, followed by coal-fired plants and then wind generation (DOE/EIA 2001a).

The EIA also projects that new nuclear power plants will not account for any new generation capacity in the United States through the year 2020 because natural-gas- and coal-fired plants are projected to be more economical (DOE/EIA 2001a). In spite of this projection, since 1997, the NRC has certified three new standard designs for nuclear power plants under the procedures in 10 CFR Part 52 Subpart B. Therefore, a new nuclear plant alternative for replacing power generated by Quad Cities 1 and 2 is considered for reasons stated in Section 8.2.3. The submission to the NRC of these three applications for certification indicates continuing interest in the possibility of licensing new nuclear power plants. The NRC has established a new organization to prepare for and manage future reactor and site licensing applications.

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- (a) In the combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.
- (b) A base-load plant normally operates to supply all or part of the minimum continuous load of a system and consequently produces electricity at an essentially constant rate. Nuclear power plants are commonly used for base-load generation; that is, these units generally run near full load.

Note that this section discusses the impacts of alternative generation technologies. It does not address the impacts of decommissioning. Further, it does not consider the impacts to the Quad Cities site of building alternative generation elsewhere, when such options are addressed. The no-action alternative discussed in Section 8.1, covers the impacts of shutting down Quad Cities Units 1 and 2.

### 8.2.1 Coal-Fired Generation

The environmental impacts of the coal-fired alternative are examined in this section for the Quad Cities site and an alternate site. Unless otherwise indicated, the assumptions and numerical values used in this section are from the Exelon environmental report (ER) (Exelon 2003a). The staff reviewed this information and compared it to environmental impact information in the GEIS, as well as other relevant information and sources where appropriate. Although the OL renewal period is only 20 years, the impact of operating the coal-fired alternative for 40 years is considered (as a reasonable projection of the operating life of a coal-fired plant). The staff assumed that Quad Cities Units 1 and 2 would remain in operation while the coal-fired alternative was constructed.

The coal-fired alternative is analyzed both for the existing Quad Cities site and for an unnamed alternate site. Siting a new coal-fired plant where an existing nuclear plant is located would reduce many construction impacts (NRC 1996). Further, siting a new facility at the existing Quad Cities site would allow it to take advantage of existing infrastructure. Hence, although the staff considered an alternate site, it is unlikely that it would be beneficial to place a new coal-fired facility at an alternate site based purely on environmental grounds.

The staff assumes construction of three 550-megawatts electric (MW[e]) units, for a combined capacity of 1650 MW(e), as potential replacements for Quad Cities Units 1 and 2, which is consistent with Exelon's ER (Exelon 2003a).<sup>(a)</sup> Exelon chose this size to be consistent with the natural gas-fired alternative, which was chosen to match "standard" sizes for new combined-cycle facilities. The assumption of 1650 MW(e) understates the environmental impacts of replacing the 1860 MW(e) from Quad Cities Units 1 and 2. The remaining capacity would be made up from other sources. As a rough estimate, if a coal-fired plant of exactly 1860 MW(e) were to be built, any impacts (for example, quantities of air pollutants) in this section might simply be adjusted upward accordingly. However, given these adjustments, the staff has determined that the differences in impacts between 1650 MW(e) and 1860 MW(e) of coal-fired generation would not be significant and would not change the impact levels.

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(a) The coal-fired units would have a rating of 583 gross MW(e) and 550 net MW(e). The difference between "gross" and "net" is the electricity consumed on site.

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Exelon assumes the coal-fired alternative would use tangentially fired, dry-bottom combustors with an associated heat rate<sup>(a)</sup> of 10,200 Btu/kWh (a thermodynamic efficiency of approximately 30 percent) and a capacity factor<sup>(b)</sup> of 0.85 (Exelon 2003a). According to Exelon, the coal-fired plant would consume approximately 6.3 million MT (6.9 million tons) per year of pulverized bituminous coal with an ash content of approximately 6.9 percent (Exelon 2003a). For emissions control, the facility would be outfitted with low nitrogen oxide (NO<sub>x</sub>) burners, overfire air and selective catalytic reduction for NO<sub>x</sub> control, fabric filters for control of particulates, and a wet scrubber using lime for sulfur oxide (SO<sub>2</sub>) control.

The coal-fired alternative would require converting a significant quantity of land to industrial use for the power plant, coal storage, landfill disposal of ash, spent catalytic reduction catalyst (used for control of NO<sub>x</sub> emissions), and scrubber sludge. Exelon believes that the Quad Cities site is adequate to support these requirements. The Quad Cities site consists of approximately 327 ha (817 ac) (Exelon 2003a). The GEIS asserts that approximately 700 ha (1700 ac) would be required to build a 1000 MW<sup>(c)</sup> coal-fired power plant at a greenfield site (NRC 1996). Locating a coal-fired power plant at an existing nuclear site would significantly lower this land requirement and would allow the new facility to take advantage of existing infrastructure at the Quad Cities site, including switchyard, offices, intake and discharge, and transmission rights-of-way. Exelon estimates that the coal-fired alternative would require approximately 75 ha (180 ac) for waste disposal and approximately 120 ha (300 ac) for the powerblock and coal storage area. To use the Quad Cities site, Exelon would likely need to acquire additional adjacent acreage, some of which had recently been divested.

Two coal-and-lime delivery options are most appropriate for the Quad Cities site: barge and rail. The Quad Cities site location lends itself to coal delivery by barge, which is a common practice along the Mississippi River waterway. The barge alternative would require construction of a barge offloading facility on Pool 14 and a conveyor system to the station coal yard. These new facilities would result in greater construction impacts than upgrading the existing rail line (Exelon 2003a). The alternative would trade barge traffic impacts for rail traffic impacts. The staff agrees with Exelon that such a tradeoff provides no obvious environmental benefit and the barge alternative is considered in this section. A coal slurry pipeline is another potential alternative for delivering coal. However, such a pipeline would need to cover a great distance to reach a suitable coal mining area or the coal would need to be transported by alternative means (e.g., rail) to a site closer to the Quad Cities site for introduction into the pipeline. The coal slurry pipeline alternative for delivering coal is not further evaluated.

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(a) Heat rate is a measure of generating station thermal efficiency. It is generally expressed in British thermal units (Btu) per net kilowatt-hour (kWh). It is computed by dividing the total Btu content of fuel burned for electricity generation by the resulting net kWh generation.

(b) The capacity factor is the ratio of electricity generated, the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

### 8.2.1.1 Closed-Cycle Cooling System

For purposes of this SEIS, the staff assumed a coal-fired plant at the Quad Cities site would use a closed-cycle cooling system. While the existing system is open-cycle, using water from the Mississippi River, Exelon notes that the U.S. Environmental Protection Agency (EPA) has revised requirements that could affect the design of the cooling-water intake structures for new facilities (EPA 2001a) and has proposed requirements that could affect modifications at existing facilities (EPA 2002). For this reason, this section considers a closed-cycle system using cooling towers at both the Quad Cities site and an alternate site.

The overall impacts of the coal-fired generating system using a closed-cycle cooling system are discussed in the following sections and are summarized in Table 8-2. For completeness, the staff also considered the impacts of a fully open-cycle cooling system at the Quad Cities site. Additional impacts from the use of an open-cycle cooling system are considered in Section 8.2.1.2.

- **Land Use**

For siting a new facility at the Quad Cities site, the existing infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required. Specifically, the staff assumed that the new coal-fired facility would use the switchyard, offices, and transmission rights-of-way. If the coal-fired facility is built at the existing Quad Cities site, Exelon estimates that construction of the power block and coal storage area would impact approximately 120 ha (300 ac) of land and associated terrestrial habitat (Exelon 2003a). Exelon further estimates that ash- and scrubber-waste disposal over a 40-year facility lifetime would require approximately 75 ha (180 ac) (Exelon 2003a). In total, the facility is expected to require approximately 195 ha (480 acres) of land. The GEIS estimates 700 ha (1700 ac) for a 1000-MW(e), coal-fired greenfield, power plant, well above the estimates from Exelon for the 1650-MW(e) power plant. Much of the difference is due to the potential to use existing infrastructure at the Quad Cities site with neighboring land to support the coal-fired alternative.

The coal-fired alternative at the Quad Cities site would require construction of a barge offloading facility at Pool 14 and a conveyor system to the plant's coal yard, requiring the conversion of riverfront land to industrial use.

For an alternate, greenfield site, the land use would be above 700 ha (1700 ac) assumed in the GEIS for a new 1000-MW(e), coal-fired power plant, assuming scaling of the GEIS estimates. A new site would require land for the power block, coal storage and handling, and waste products. Additional land could be required for a transmission line and for a rail spur to the plant site, depending on the infrastructure in existence at the alternate site.

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**Table 8-2. Summary of Environmental Impacts of Coal-Fired Generation at the Quad Cities Site and an Alternate Site Using Closed-Cycle Cooling**

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Land Use	MODERATE	Would use unused portion of Quad Cities site, and potentially, portions of neighboring land. Would require approximately 195 ha (480 ac) for power block, coal storage, and waste disposal. Would use any existing infrastructure (e.g., transmission lines). Additional land impacts for coal and limestone mining.	MODERATE to LARGE	Potentially 1150 ha (2800 ac) for new coal facility, including power block, infrastructure, coal storage, and waste disposal. Additional land impacts for coal and limestone mining. Total impact would depend on whether the alternate site is previously disturbed.
Ecology	MODERATE to LARGE	Would use undeveloped areas at Quad Cities site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	MODERATE to LARGE	Impact would depend on whether site is previously developed. Factors to consider include location and ecology of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.
Water Use and Quality	SMALL	Would use closed-cycle cooling system, reducing cooling water requirements while increasing evaporative, consumptive use and new heat rejection to the atmosphere and would continue very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, and the characteristics of surface water body or groundwater source.

Table 8-2. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Air Quality	MODERATE	<p>Sulfur oxides</p> <ul style="list-style-type: none"> <li>• 6000 MT/yr (6600 tons/yr). Actual impact would depend on emissions offsets.</li> </ul> <p>Nitrogen oxides</p> <ul style="list-style-type: none"> <li>• 1514 MT/yr (1669 tons/yr). Actual impact would depend on emissions offsets.</li> </ul> <p>Particulates</p> <ul style="list-style-type: none"> <li>• 216 MT/yr (238 tons/yr) particulates, 50 MT/yr (55 tons/yr) PM<sub>10</sub></li> </ul> <p>Carbon monoxide</p> <ul style="list-style-type: none"> <li>• 1561 MT/yr (1721 tons/yr)</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• Some hazardous air pollutants, CO<sub>2</sub> emissions contribute to global warming</li> </ul>	MODERATE	Same emissions as Quad Cities site, although offsets for SO <sub>2</sub> and NO <sub>x</sub> would depend on location.
Waste	MODERATE	Total ash production would be 431,000 MT (475,000 tons) annually, but 87 percent of this ash would be recycled. Facility would also generate 311,000 MT (343,000 tons) of scrubber sludge.	MODERATE	Same impacts as for Quad Cities site.
Human Health	SMALL	Impacts are uncertain but are considered SMALL in the absence of more quantitative data.	SMALL	Same impacts as for Quad Cities site.



Alternatives

Table 8-2. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Socio-economics	SMALL to MODERATE	During construction, impacts would be SMALL. Up to 2500 workers might be required at the peak of the 5-year construction period.	SMALL to LARGE	Construction impacts at alternate site would be similar to those at Quad Cities site, but would depend on whether new site is located near a major metropolitan area.
		During operation, employment would decrease from approximately 1000 permanent and contract workers to approximately 250. All employment impacts would be tempered by proximity to the Quad Cities metropolitan area. No impact on tax base.		Minimal impacts on local tax base.
		Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.		Transportation impacts would be similar to those at the Quad Cities site.
Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant buildings and structures, along with noise impacts from plant operation.	MODERATE to LARGE	Impact would be similar to those at the Quad Cities site, but would also include any aesthetic impacts from building a new transmission line(s). Impacts would depend on location.
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped or developed site.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped site.

Table 8-2. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole.	SMALL to LARGE	Impacts would vary depending on population distribution and characteristics at new site. Impacts on Quad Cities site would be identical to those in the no-action alternative.

Regardless of whether the coal-fired alternative is built at the Quad Cities site or at an alternate site, additional land-use changes would occur offsite in an undetermined coal mining area to supply coal for the plant. In the GEIS, the staff estimated that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing the waste to support a 1000-MW(e) coal plant during its operational life (NRC 1996). Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for Quad Cities Units 1 and 2. In the GEIS, the staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant.

Overall, the impacts of the coal-fired alternative at the Quad Cities site are considered MODERATE. Previously unused land would need to be converted to industrial use. Overall, the impacts of the coal-fired alternative at an alternate site are considered MODERATE to LARGE, depending on whether the alternate site had been developed previously or not and what new infrastructure might be required.

- Ecology

Locating a coal-fired plant at the Quad Cities site would alter ecological resources because of construction, and because of the need to convert currently unused land to industrial use for the plant, coal storage, and ash- and scrubber-sludge disposal. However, some of this land has been previously disturbed. Use of cooling towers would reduce operational impacts on the aquatic ecosystem. Impacts could include habitat degradation, fragmentation, or loss as a result of construction activities and conversion of land to industrial use. Ecological communities may experience reduced productivity and biological diversity from disturbing previously intact land. Construction of a barge offloading facility would affect terrestrial habitat along the river bluffs as well as aquatic habitat associated

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with construction, maintenance, and operation of the offloading facility. Overall, the impacts of the coal-fired alternative at the Quad Cities site are considered MODERATE to LARGE.

At an alternate site, the coal-fired alternative would introduce construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts may alter the ecology. Impacts could include habitat degradation, fragmentation or loss, reduced ecosystem productivity (i.e., including wildlife species), and a reduction in biological diversity. Construction and maintenance of transmission lines and a rail spur would have ecological impacts. Use of make-up cooling water from a nearby surface water body could have adverse aquatic resource impacts. Overall, the impacts of the coal-fired alternative at an alternate site are considered MODERATE to LARGE, depending on the degree to which the site has already been disturbed by industrial use.

- **Water Use and Quality**

The coal-fired alternative at the existing site would use cooling towers and would, therefore, reduce the cooling-water needs from their existing levels. There would still be consumptive use of water due to evaporation from the cooling towers. At both the Quad Cities site and an alternate site, plant discharges would consist mostly of cooling-tower blowdown, characterized primarily by an increased temperature and increased concentration of dissolved solids relative to the receiving body of water and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary waste water would also be discharged. All discharges would likely be regulated through a national pollution discharge elimination system (NPDES) permit. Some erosion and sedimentation probably would occur during construction (NRC 1996). At the Quad Cities site, the five groundwater wells that supply limited, specific uses at the Quad Cities site would continue to be used. Use of groundwater for a coal-fired plant at an alternate site is a possibility. Overall, the impacts of the coal-fired alternative at the Quad Cities site are SMALL. The impacts of the coal-fired alternative at an alternate site are considered SMALL to MODERATE.

- **Air Quality**

The air quality impacts of coal-fired generation are significantly higher than those of nuclear generation due to emissions of sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), particulates, carbon monoxide, hazardous air pollutants, such as mercury, and naturally occurring radioactive materials.

The Quad Cities site is located in the Metropolitan Quad Cities Interstate Air Quality Control Region. All counties in this air quality control region are designated as being in attainment for all criteria pollutants (40 CFR 81.102; 40 CFR 81.316). All counties in Illinois within 50 miles of the Quad Cities site are designated as being in attainment for all criteria pollutants, as are all counties in Iowa (40 CFR 81.314; 40 CFR 81.316).

A new coal-fired generating plant located at the Quad Cities site would likely need a prevention of significant deterioration (PSD) permit and an operating permit under the Clean Air Act (CAA). The plant would need to comply with the new source performance standards for such plants set forth in 40 CFR Part 60 Subpart Da, which consists of 40 CFR Part 60.40a through 40 CFR Part 60.49a. Standards establish limits for particulate matter and opacity (40 CFR 60.42a), SO<sub>2</sub> (40 CFR 60.43a), and NO<sub>x</sub> (40 CFR 60.44a).

Section 169A of the CAA (42 USC 7491) establishes a national goal of preventing future, and remedying existing, impairment of visibility or mandatory Class 1 Federal areas when impairment results from man-made air pollution. In addition, EPA issued a new regional haze rule in 1999 (EPA 1999). The rule specifies that for each mandatory class I Federal area located within a State, the State must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable-progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 1.308[d][1]). If a new coal-fired power station were located close to a mandatory class I Federal area, additional air pollution control requirements could be imposed. However, there are no mandatory class I Federal areas near the Quad Cities site. It is assumed that an alternate site would not be chosen near a mandatory class I Federal area.

The U.S. EPA has various regulatory requirements for visibility protection in 40 CFR Part 51, Subpart P, including a specific requirement for the review of any new major stationary source in an area designated as attainment or unclassified under the CAA. As noted above, the Quad Cities site is in a region that is either attainment or unclassified for all criteria pollutants.

Impacts and issues for particular pollutants follow. Unless otherwise stated, the impacts would be the same at the Quad Cities site or at an alternate site.

Sulfur oxides. A new coal-fired power plant would be subject to the requirements in Title IV of the CAA. Title IV was enacted to reduce emissions of SO<sub>2</sub> and NO<sub>x</sub>, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power-plant SO<sub>2</sub> emissions and imposes controls on SO<sub>2</sub> emissions through a system of marketable allowances. The EPA issues one allowance for each ton of SO<sub>2</sub> that a unit is allowed to emit. New units do not receive allowances, but they are required to have allowances to cover their SO<sub>2</sub> emissions. Owners of new units must, therefore, purchase allowances from owners of other power plants or reduce SO<sub>2</sub> emissions at other power plants they own. Allowances can be banked for use in future years. Because Exelon has no fossil-fired power plants (Exelon 2003a), it would need to purchase

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allowances from the open market to operate a coal-fired power plant at the Quad Cities site. Whether the coal-fired alternative results in an aggregate increase in SO<sub>2</sub> emissions will depend on whether the permits are purchased when there is a surplus of permits or when the market is constrained. In the latter case, the coal-fired alternative would result in no net increase in aggregate national SO<sub>2</sub> emissions. Regardless, the coal-fired power plant would result in a local increase in SO<sub>2</sub> emissions whether located at the Quad Cities site or an alternate site.

Exelon states in its ER that the alternative coal-fired power plant would minimize air emissions through a combination of boiler technology and post-combustion pollution removal. SO<sub>2</sub> would be removed using lime in a flue-gas desulfurization process (Exelon 2003a). Exelon estimates that by using a wet-scrubber control technology, 95 percent of the stack emissions of SO<sub>2</sub> could be collected, so that total annual stack emissions, after scrubbing, would be approximately 6000 MT (6600 tons) of SO<sub>x</sub> (Exelon 2003a).

Nitrogen oxides and Volatile Organic Compounds. Ground-level ozone is a primary concern of the U.S. EPA. Ground-level ozone is formed when oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone precursors such as these, and ozone itself, can be carried hundreds of miles from their source, potentially causing pollution over wide regions.

In 1998, the EPA promulgated a rule requiring 21 states, including Illinois, to reduce NO<sub>x</sub> emissions (63 FR 57356 [EPA 1998a]). The rule specifies total NO<sub>x</sub> emissions (40 CFR 51.121e) for each State, but leaves open the method of implementation. The emissions-reduction measures are to be in place by May 31, 2004. Illinois, in its State Implementation Plan (SIP), has chosen to implement a market-based emissions credit trading system for NO<sub>x</sub>. According to the system, NO<sub>x</sub> emissions from large, electricity-generating units may not exceed 27,851 MT (30,701 tons) during each ozone season. A small percentage of NO<sub>x</sub> credits was set aside for new sources (Exelon 2003a). New NO<sub>x</sub> emissions will, therefore, depend both on how many new credits are available and whether any purchases of credits are made in a constrained market. In the most extreme case, all of the credits would need to be purchased on the open market and such purchases would result in reductions from sources elsewhere. Even in this case, however, NO<sub>x</sub> emissions could simply move out of State. The staff assumed that even if the coal-fired alternative were located at an alternate site, the alternate site would be in Illinois and, therefore, subject to the allowance system.

Section 407 of the CAA establishes technology-based limitations for NO<sub>x</sub> emissions. The market-based allowance system used for SO<sub>2</sub> emissions is not used for NO<sub>x</sub> emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants at 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (EPA

1998b), limits the discharge of any gases that contain nitrogen oxides (expressed as NO<sub>x</sub>) in excess of 200 ng/J of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

Exelon estimates that by using the best available control technology, the total annual NO<sub>x</sub> emissions for a new coal-fired power plant would be approximately 1561 MT (1721 tons) (Exelon 2003a). This level of NO<sub>x</sub> emissions might not result in greater statewide emissions depending on the nature of the credit purchases to cover these emissions. Exelon estimates that annual VOC emissions from the coal-fired alternative would be approximately 188 MT (207 tons). The coal-fired alternative will most likely result in an increase in statewide VOC emissions, and certainly in local VOC emissions.

Particulates. Exelon estimates that the total annual stack emissions would include 216 MT (238 tons) of filterable total suspended particulates (particulates that range in size from less than 0.1 micrometer [ $\mu\text{m}$ ] up to approximately 45  $\mu\text{m}$ ) (Exelon 2003a). This would include 50 MT (55 tons) per year of particulate matter having an aerodynamic diameter less than or equal to 10  $\mu\text{m}$  (PM<sub>10</sub>) (Exelon 2003a). Fabric filters, with a 99.9 percent removal efficiency, would be used to control particulates (Exelon 2003a). In addition, coal handling equipment would introduce fugitive particulate emissions.

Construction of a coal-fired plant would generate fugitive dust. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process.

Carbon monoxide. Exelon estimates that the total carbon monoxide emissions would be approximately 1561 MT (1721 tons) per year (Exelon 2003a).

Hazardous air pollutants, including mercury. In December 2000, the EPA issued a regulatory finding on the emissions of hazardous air pollutants from electric utility steam-generating units (65 FR 79825 [EPA 2000b]). The EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by the EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (65 FR 79825 [EPA 2000b]). The EPA concluded that mercury is the hazardous air pollutant of greatest concern. The EPA found that (1) there is a link between coal consumption and mercury emissions, (2) electric utility steam-generating units are the largest domestic source of mercury emissions, and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from the consumption of contaminated fish (65 FR 79825 [EPA 2000b]). Accordingly, the EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the CAA for which emission standards for hazardous air pollutants will be issued (65 FR 79825 [EPA 2000b]).

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**Uranium and thorium.** Coal contains uranium and thorium. Uranium concentrations are generally in the range of 1 to 10 parts per million. Thorium concentrations are generally about 2.5 times greater than uranium concentrations (Gabbard 1993). One estimate is that a typical coal-fired plant released roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium in 1982 (Gabbard 1993). The population dose equivalent from the uranium and thorium releases and daughter products produced by the decay of these isotopes has been calculated to be significantly higher than that from nuclear power plants (Gabbard 1993).

**Carbon dioxide.** A coal-fired plant would have unregulated carbon dioxide emissions that would contribute to global warming. While these emissions have not traditionally been an important environmental concern, they are becoming increasingly relevant at both a national and an international level.

**Summary.** The GEIS analysis did not quantify emissions from coal-fired power plants, but the analysis implied that air impacts would be substantial. The GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO<sub>x</sub> and NO<sub>x</sub> emissions as potential impacts (NRC 1996). Adverse human health effects from coal combustion, such as cancer and emphysema, have been associated with the products of coal combustion. Overall, the air quality impacts from coal-fired generation at either the Quad Cities or an alternate site are considered MODERATE. The impacts would be clearly noticeable, but they would not destabilize air quality.

- **Waste**

Coal combustion generates waste in the form of ash; and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction catalyst, and scrubber sludge. Assuming 99.9 percent ash removal, the three 550-MW(e) coal-fired units would generate approximately 431,000 MT (475,000 tons) of this ash annually (Exelon 2003a). According to Exelon, Illinois regulations encourage recycling of coal-combustion byproducts, and Exelon (then ComEd) historically recycled 87 percent of its coal ash (Exelon 2003a). Assuming continuation of this waste mitigation measure, the coal-fired alternative would generate approximately 56,000 (62,000 tons) of ash per year for disposal (Exelon 2003a). In addition, approximately 311,000 MT (343,000 tons) per year of scrubber sludge would be generated by SO<sub>x</sub>-controlled equipment (Exelon 2003a). This equipment would use approximately 116,000 tons of calcium oxide (lime) in the scrubbing process to control SO<sub>x</sub> emissions.

The waste would be disposed of onsite, accounting for approximately 75 ha (180 ac) of land area over the 40-year plant life, assuming a waste depth of 30 feet (Exelon 2003a). Waste

impacts to groundwater and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs. Disposal of the waste could noticeably affect land use and groundwater quality, but with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land could be available for other uses.

In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes From the Combustion of Fossil Fuels" (EPA 2000a). The EPA concluded that some form of national regulation is warranted to address coal-combustion waste products because (1) the composition of these wastes could present danger to human health and the environment under certain conditions; (2) the EPA has identified 11 documented cases of proven damages to human health and the environment by improper management of these wastes in landfills and surface impoundments; (3) present disposal practices are such that in 1995, these wastes were being managed in 40 to 70 percent of landfills and surface impoundments without reasonable controls in place, particularly in the area of groundwater monitoring; and (4) the EPA identified gaps in the State oversight of coal-combustion wastes. Accordingly, the EPA announced its intention to issue regulations for the disposal of coal-combustion waste under Subtitle D of the Resource Conservation and Recovery Act.

Overall, the waste impacts of the coal-fired alternative at the Quad Cities site or at an alternate site are considered MODERATE. The impacts would be clearly noticeable, but they would not destabilize any important resource.

- **Human Health**

Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risks from coal and lime/limestone transportation, worker and public risks from disposal of coal-combustion wastes, and public risks from the inhalation of stack emissions. Emission impacts can be widespread, and health risks can be difficult to quantify. The coal alternative also introduces the risk of coal pile fires and attendant inhalation risks.

The staff stated in the GEIS that there could be human health impacts (cancer and emphysema) from the inhalation of toxins and particulates from coal-fired plants, but the staff did not identify the significance of these impacts (NRC 1996). In addition, the discharges of uranium and thorium from coal-fired plants can potentially produce radiological doses in excess of those arising from nuclear-power-plant operations (Gabbard 1993).

Regulatory agencies, including the EPA and State agencies, set air-emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. The EPA has recently concluded that



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certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants. However, in the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal are characterized as **SMALL**. This characterization holds for a coal-fired generation plant at the Quad Cities site and at an alternate site.

- **Socioeconomics**

Construction of the coal-fired alternative would take approximately 5 years. The staff assumed that construction would take place while Quad Cities Units 1 and 2 continues operation and would be completed by the time Quad Cities Units 1 and 2 permanently cease operation. The GEIS estimates a peak workforce during construction of between 1200 and 2500 workers for a 1000-MW(e) power plant (NRC 1996). This workforce would likely be larger for the 1650-MW(e) coal-fired alternative.

If the facility were constructed at the Quad Cities site, these workers would be in addition to the 850 permanent employees and approximately 130 contract workers that currently work at the Quad Cities site. During construction of the new coal-fired plant, surrounding communities would experience demands on housing and public services that could have **SMALL** impacts. These impacts would be tempered because the Quad Cities site is part of the Quad Cities metropolitan area. After construction, the nearby communities would be impacted by the loss of the construction jobs.

Exelon estimates that the new coal-fired plant would have a workforce of approximately 250 (Exelon 2003a). If the coal-fired alternative were constructed at the Quad Cities site and Quad Cities Units 1 and 2 were decommissioned, there would be a loss of 600 permanent, high-paying jobs (850 for Quad Cities Units 1 and 2 down to 250 for the coal-fired alternative), along with the loss of 130 contract workers, with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. These impacts may be offset because the Quad Cities site is in the Quad Cities metropolitan area. The coal-fired alternative would provide a new tax base to offset the loss of tax base associated with decommissioning of Quad Cities Units 1 and 2. For all of these reasons, the appropriate characterization of non-transportation socioeconomic impacts for operating a coal-fired plant constructed at the Quad Cities site is considered **SMALL**.

The capital expenditures associated with the new plant would lead to an increase in assessed value and tax revenue that would probably be substantial for several of the taxing bodies associated with Cordova Township. Therefore, this alternative would probably have a positive impact in tax revenues. However, even though these new tax revenues would probably more than replace tax revenues lost upon the decommissioning of the current

plant, they would not have more than a **SMALL** effect in terms of tax-related land use effects.

The impacts of a new coal-fired facility at an alternate site would depend on the socioeconomic characteristics of the new site. If the site were near a large urban center, as the Quad Cities site is, then the impacts would be small. On the other hand, in the GEIS, the staff stated that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction workforce would need to move into the area to work (NRC 1996). Alternate sites would, therefore, need to be analyzed on a case-by-case basis. Socioeconomic impacts from construction of the new site could range from **SMALL** to **LARGE**, depending on the characteristics of the surrounding regions. Impacts from operating the facility could range from **SMALL** to **MODERATE**, depending on the characteristics of the surrounding regions.

For transportation related to the commuting of plant-operating personnel, the impacts are considered **SMALL**. The maximum number of plant-operating personnel would be approximately 250 compared to the current permanent workforce of 850 and contract workforce of 130 (Exelon 2003a). Therefore, traffic impacts associated with plant personnel commuting to a coal-fired plant would be expected to be **SMALL** compared to the current impacts from Quad Cities Units 1 and 2. This would hold for both the Quad Cities site and an alternate site.

During the 5-year construction period for the replacement coal-fired units, a large number of construction workers would be working at the site in addition to the workers currently at the Quad Cities site. The addition of these workers could place significant traffic loads on existing highways near either the Quad Cities site or an alternate site. Such impacts would be **MODERATE**.

For most alternate sites, coal and lime would likely be delivered by rail, although barge delivery is feasible for a location on navigable waters. Transportation impacts would depend upon the site location. Socioeconomic impacts associated with rail transportation would likely be **MODERATE** to **LARGE**. Barge delivery of coal and lime/limestone would likely have **SMALL** socioeconomic impacts.

- **Aesthetics**

The coal-fired power-plant units stand as high as 60 m (200 ft) tall. The exhaust stacks stand as high as 120 to 185 m (400 to 600 ft) tall. These structures would be visible offsite during daylight hours. Buildings and structures would also be visible at night because of outside lighting. Cooling towers would be required (up to 160 m [520 ft] high in the case of natural draft towers and up to 30 m [100 ft] high in the case of mechanical draft towers), and

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these towers and their associated plumes would also be visible offsite. The Federal Aviation Administration (FAA) generally requires that all structures exceeding an overall height of 61 m (200 ft) above ground level have markings and/or lighting so as not to impair aviation safety (FAA 2000). Visual impacts of buildings and structures could be mitigated by landscaping and color selection that is consistent with the environment. Nighttime visual impacts could be mitigated by appropriate use of light shielding and reduced use of lighting that still meets FAA requirements. There would also be impacts from the barge offloading facility on the river bluffs. At the Quad Cities site, visual aesthetic impacts are considered MODERATE.

At an alternate site, the aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to the other power plants. There would also be significant aesthetic impacts from a new transmission line and any rail line needed to deliver coal and lime. Overall, the visual aesthetic impacts associated with a replacement coal-fired power plant at an alternate site are considered MODERATE to LARGE and will depend on the exact location of the alternate site.

Coal-fired generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, use of outside loudspeakers, and the commuting of plant employees. Noise impacts associated with rail delivery of coal and lime/limestone at an alternate site would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces its impact. The noise impacts of a coal-fired plant at the Quad Cities site are considered to be MODERATE. At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities.

- **Historic and Archaeological Resources**

At the Quad Cities site or an alternate site, a cultural-resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of cultural resources, identification, and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Quad Cities site or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-ways). Historic and archaeological resource impacts need to be evaluated on a site-specific basis. The impacts can generally be effectively managed, and as such, impacts would vary between SMALL to MODERATE, depending on what historic and archaeological resources are present, and whether mitigation is necessary.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the Quad Cities site. Other impacts, such as impacts on housing availability and prices during construction, might occur, and this could disproportionately affect minority and low-income populations. Closure of Quad Cities Units 1 and 2 would result in a decrease in employment of approximately 850 permanent operating employees and 130 contract employees (same as in the no-action case), but this would be partially offset by construction and operation of the replacement power plant. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, the Quad Cities site is located near an active urban area with many employment possibilities. Overall, impacts would be SMALL and would depend on the ability of minority or low-income populations to commute to other jobs outside the area. The impacts around the alternate site would depend upon the site chosen and the nearby population distribution. These impacts could vary between SMALL and LARGE.

#### **8.2.1.2 Open-Cycle Cooling System**

The environmental impacts of constructing a coal-fired generation system at the Quad Cities site using the existing open-cycle cooling system are largely the same as the impacts for a coal-fired plant using a closed-cycle system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-3 summarizes the incremental differences.

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**Table 8-3. Summary of Environmental Impacts of Coal-Fired Generation at the Quad Cities Site Using Open-Cycle Cooling**

<b>Impact Category</b>	<b>Change in Impacts from Open-Cycle Cooling System</b>
Land Use	10 to 12 ha (25 to 30 ac) less land required because cooling towers and associated infrastructure are not needed.
Ecology	Impacts would depend on ecology at the site. No impact to terrestrial ecology from cooling-tower drift. Increased water withdrawal with possible greater impact on aquatic ecology.
Surface Water Use and Quality	No discharge of cooling-tower blowdown. Increased water withdrawal and more thermal load on the Mississippi River.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Aesthetics	Reduced aesthetic impact because cooling towers would not be used.
Historic and Archaeological Resources	Less land impacted.
Environmental Justice	No change.

### 8.2.2 Natural Gas-Fired Generation

The environmental impacts of the natural-gas alternative are examined in this section. Unless otherwise indicated, the assumptions and numerical values used in this section are from the Exelon ER (Exelon 2003a). The staff reviewed this information and compared it to environmental impact information in the GEIS, as well as other relevant information and sources when appropriate. Although the OL renewal period is only 20 years, the impact of operating the natural gas-fired alternative for 40 years is considered as a reasonable projection of the operating life of a natural gas-fired plant.

The staff assumed that Quad Cities Units 1 and 2 would remain in operation while the natural gas-fired alternative was constructed. Consistent with the Exelon ER (Exelon 2003a), the staff assumed a combined-cycle<sup>(a)</sup> natural-gas facility based on three 550-MW(e) combined-cycle

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(a) In a combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste-combustion heat from the combustion turbine is routed through a heat-recovery boiler to make steam to generate additional electricity.

units, for a total facility size of 1650 MW(e) (Exelon 2003a).<sup>(a)</sup> The 550-MW(e) units are a standard size, which would minimize the cost of the new facility. Any shortfall in capacity would be made up from other sources. This assumption understates the environmental impacts of replacing the 1860 MW(e) from Quad Cities Units 1 and 2. As a rough estimate, if a natural gas-fired plant of exactly 1860 MW(e) were to be built, any numerical impacts in this section, for example, quantities of air pollutants, might simply be adjusted upward accordingly.

However, given these adjustments, the staff has determined that the differences in impacts between 1650 MW(e) and 1860 MW(e) of natural gas-fired generation would not be significant and would not change the impact levels.

The natural gas-fired alternative is analyzed both for the existing Quad Cities site and for an unnamed alternate site. Siting a new natural gas-fired plant where an existing nuclear plant is located would result in less impact. Hence, although the staff considered an alternate site, it is unlikely that it would be beneficial to place a new natural gas-fired facility at an alternate site based purely on environmental grounds. The GEIS estimates that 45 ha (110 ac) would be required for a new 1000-MW(e) combined-cycle facility, a much smaller land requirement than for a coal-fired facility. Exelon concluded in its ER that the Quad Cities site would be a reasonable site for location of a natural gas-fired generating unit (Exelon 2003a). Locating the natural gas-fired alternative at an existing nuclear site would allow the new facility to take advantage of existing infrastructure at the Quad Cities site, including switchyard, offices, intake and discharge, and transmission rights-of-way.

Exelon made the following estimates to describe the combined-cycle facility (Exelon 2003a):

- Heat Rate: 6120 Btu/kWhr
- Natural Gas Heating Value: 1021 Btu/ft<sup>3</sup>
- Capacity Factor: 0.85

These assumptions were deemed by the staff to be consistent with current practice with combined-cycle facilities. For emissions control, the facility would be outfitted with standard technologies, which include selective catalytic reduction and steam/water injection for NO<sub>x</sub> control.

Operation of a new combined-cycle facility at the Quad Cities site would require a new gas line. Exelon estimated that at least 9.6 km (6 mi) of 0.41-m (16-in.) gas pipeline would be required (Exelon 2003a). Exelon further estimated that this pipeline would require approximately 40 to

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(a) The natural gas-fired units would have a rating of 572 gross MW(e) and 550 net MW(e). The difference between "gross" and "net" is the electricity consumed on site.

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- | 49 ha (100 to 120 ac) for an easement (Exelon 2003a). The gas line requirements at an alternate site would depend on the characteristics and location of the alternate site.

**8.2.2.1 Closed-Cycle Cooling System**

For purposes of this SEIS, the staff assumed a natural gas-fired plant would use a closed-cycle cooling system at the Quad Cities site. The overall impacts of the natural gas-fired generating system using a closed-cycle cooling system at the Quad Cities site and at an alternate site are discussed in the following sections and summarized in Table 8-4. For completeness, the staff also considered the impacts of a fully open-cycle cooling system at the Quad Cities site, consistent with current practice. Additional impacts from the use of an open-cycle cooling system are considered in Section 8.2.1.2.

| **Table 8-4. Summary of Environmental Impacts of Natural Gas-Fired Generation at the Quad Cities Site and an Alternate Site Using Closed-Cycle Cooling**

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Land Use	SMALL to MODERATE	Upwards 45 ha (110 ac) for power block, offices, roads, and parking areas. Additional impact for construction of underground gas pipeline.	SMALL to LARGE	Upwards of 45 ha (110 ac) for power block, offices, roads, and parking areas. Additional impact for construction and/or upgrade of an underground gas pipeline, if required, along with any needed transmission lines.
Ecology	SMALL to MODERATE	Would use undeveloped areas at Quad Cities site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	SMALL to LARGE	Impact would depend on whether site is previously developed. Factors to consider include location and ecology of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.

Table 8-4. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Water Use and Quality	SMALL	Would use closed-cycle cooling system with natural gas-fired combined cycle units. This would result in a significant reduction in cooling water requirements. The facility would continue very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, the characteristics of surface water or groundwater source, and the new intakes structures required.
Air Quality	MODERATE	<p>Sulfur oxides</p> <ul style="list-style-type: none"> <li>• 121 MT/yr (133 tons/yr).</li> </ul> <p>Nitrogen oxides</p> <ul style="list-style-type: none"> <li>• 386 MT/yr (426 tons/yr).</li> </ul> <p>Actual impact would depend on emissions offsets.</p> <p>Particulates</p> <ul style="list-style-type: none"> <li>• 67 MT/yr (74 tons/yr) PM<sub>10</sub></li> </ul> <p>Carbon monoxide</p> <p>80 MT/yr (88 tons/yr)</p> <p>Other</p> <ul style="list-style-type: none"> <li>• CO<sub>2</sub> emissions contribute to global warming.</li> </ul>	MODERATE	Same emissions as Quad Cities site, although offsets for NO <sub>x</sub> would depend on location.
Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Same impacts as for Quad Cities site.
Human Health	SMALL	Impacts are considered to be minor.	SMALL	Same impacts as for Quad Cities site.



Alternatives

**Table 8-4. (contd)**

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL. Peak workforce during two-to-three-year construction period would be significantly smaller than for other steam-generation facilities.	SMALL to MODERATE	Construction impacts at alternate site would be similar to those at Quad Cities site, but would depend on whether new site is located near a major metropolitan area.
		During operation, employment would decrease from approximately 1000 permanent and contract workers to less than 100. All employment impacts would be tempered by proximity to Quad Cities metropolitan area. No impact on tax base.		Minimal impacts on local tax base.
		Transportation impacts during operation would be SMALL due to the smaller workforce.		Transportation impacts would be similar to those at the Quad Cities site.
		Transportation impacts associated with construction workers would be SMALL to MODERATE.		
Aesthetics	MODERATE	SMALL aesthetic impact due to impact of plant buildings and structures, along with noise impacts from plant operation. Visual impact would be similar to current Quad Cities Units 1 and 2.	MODERATE to LARGE	Impact would depend on location. Greatest impact would likely be from the new transmission line(s) that would be needed.
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped or developed site.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped site.

Table 8-4. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Any impacts would be tempered by proximity to the Quad Cities metropolitan area.	SMALL to LARGE	Impacts would vary depending on population distribution and characteristics at new site. Impacts on Quad Cities site would be identical to those in the no-action alternative.

• **Land Use**

For siting a new facility at the Quad Cities site, the existing infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required there. Specifically, the staff assumed that the new combined-cycle facility would make use of the switchyard, offices, and transmission rights-of-way. The GEIS assumes that approximately 45 ha (110 ac) would be needed for a 1000-MW(e) natural-gas facility (NRC 1996). Scaling up for the 1650-MW(e) facility considered by Exelon would indicate a proportionally larger land requirement. According to Exelon, previously disturbed acreage already exists and is available at the Quad Cities site, minimizing land-use impacts (Exelon 2003a).

If the natural gas-fired facility were built at the Quad Cities site, there would be an additional land requirement to bring in enough gas to supply the combined-cycle facility. Exelon estimated that a minimum of 9.6 km (6 mi) of 0.41-m (16-in.) gas pipeline would be required (Exelon 2003a). Exelon further estimated that this pipeline would require approximately 40 to 49 ha (100 to 120 ac) for an easement (Exelon 2003a). Exelon asserts that this would likely be of only minimal impact, because Exelon would use BMPs during construction, such as minimizing soil loss and restoring vegetation immediately after the excavation is backfilled (Exelon 2003a).

For construction at an alternate site, the full land requirement for a natural gas-fired facility would be required because no existing infrastructure would be available. Additional land could be impacted for construction of a transmission line, and natural gas and oil pipelines to serve the plant.

Regardless of whether the natural-gas facility is built at the Quad Cities site or at an alternate site, additional land could be required for natural gas wells and collection stations. In the GEIS, the staff estimated that approximately 1500 ha (3600 ac) would be needed for

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a 1000-MW(e) plant (NRC 1996). Proportionately more land would be needed for the 1650-MW(e) facility considered here. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for Quad Cities Units 1 and 2. In the GEIS (NRC 1996), the staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000-MW(e) nuclear power plant.

Overall, the land-use impacts of constructing the natural gas-fired alternative at the Quad Cities site are considered **SMALL** to **MODERATE**. Overall, the land-use impacts of siting the natural gas-fired alternative at an alternate site would depend on the chosen site, but are characterized as **SMALL** to **LARGE**.

- **Ecology**

Locating a natural gas-fired plant at the Quad Cities site would alter ecological resources because of the need to convert currently unused land to industrial use for the plant and for building a new natural gas line to the site. Some of this land would have been previously disturbed. Exelon asserts the new gas pipeline would likely be of only minimal impact, because Exelon would use BMPs during construction, such as minimizing soil loss and restoring vegetation immediately after the excavation is backfilled (Exelon 2003a). There could be potential onsite habitat degradation, fragmentation or loss, reduced ecological productivity and a reduction in biological diversity, resulting from disturbing previously intact land. Use of a closed-cycle cooling system would limit operational impacts on the aquatic ecosystem, and would reduce the use of water below current levels. Overall, the ecological impacts of the natural gas-fired alternative at the Quad Cities site are considered **SMALL** to **MODERATE**.

At an alternate site, the natural gas-fired alternative would introduce construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts may alter the ecology. Impacts could include habitat degradation, fragmentation, or loss, reduced ecological productivity and a reduction in biological diversity.

If needed, construction and maintenance of new transmission lines would have similar ecological impacts. Use of make-up cooling water from a nearby surface water body could have adverse aquatic resource impacts. Overall, the ecological impacts are dependent on whether a site had been previously developed (**SMALL** to **MODERATE**) or is an undeveloped greenfield site (**MODERATE** to **LARGE** impact).

- **Water Use and Quality**

Each of the natural gas-fired units would include a heat-recovery boiler from which steam would turn an electric generator. Steam would be condensed and circulated back to the boiler for reuse. Overall, water requirements for combined-cycle generation are much less than for conventional closed-cycle steam-electric generators. The natural gas-fired

alternative at the existing or at an alternate site would use a closed-cycle cooling system with cooling towers and would, therefore, significantly reduce water needs from what they would otherwise be in an open-cycle configuration. Plant discharges would consist mostly of cooling-tower blowdown, characterized primarily by an increased temperature and increased concentration of dissolved solids relative to the receiving body of water and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary waste water may also be discharged. All discharges would likely be regulated through a NPDES permit. Some erosion and sedimentation probably would occur during construction (NRC 1996). Use of groundwater for a natural gas-fired plant at an alternate site is a possibility. At the existing site, the five groundwater wells that supply limited specific uses would continue to be used. Some erosion and sedimentation probably would occur during construction (NRC 1996). Overall, the impacts of the natural gas-fired alternative at the Quad Cities site are considered SMALL. Overall, the impacts at an alternate site are considered SMALL to MODERATE.

- **Air Quality**

Natural gas is a relatively clean-burning fuel. The natural gas-fired alternative would release similar types of emissions, but in lesser quantities, than the coal-fired alternative. Hence, it would be subject to the same type of air quality regulations as a coal-fired plant, discussed in Section 8.2.1.1. The greatest concern from combined-cycle facilities are the emissions of ozone precursors, NO<sub>x</sub> and VOCs.

Exelon projects the following emissions for the natural gas-fired alternative (Exelon 2003a):

- Sulfur oxides – 121 MT/yr (133 tons/yr)
- Nitrogen oxides – 386 MT/yr (426 tons/yr)
- Carbon monoxide – 80 MT/yr (88 tons/yr)
- PM<sub>10</sub> particulates – 67 MT/yr (74 tons/yr)
- VOC – 74 MT/yr (82 tons/yr)

A combined-cycle facility would also have unregulated CO<sub>2</sub> emissions that could contribute to global warming. While these emissions have not traditionally been an important environmental concern, they are becoming increasingly relevant at both a national and an international level.

In December 2000, the EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (65 FR 79825 [EPA 2000b]). Natural gas-fired power plants were found by the EPA to emit arsenic, formaldehyde, and nickel (65 FR 79825 [EPA 2000b]). Unlike coal- and oil-fired plants, the EPA did not determine that emissions of hazardous air pollutants from natural gas-fired power plants should be regulated under Section 112 of the CAA.

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Construction activities would result in temporary fugitive dust. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process.

The preceding emissions would likely be the same at the Quad Cities site or at the alternate site. Impacts from the above emissions would be clearly noticeable, but they would not be sufficient to destabilize air resources as a whole. The overall air-quality impact for a new natural gas-fired generating facility sited at the Quad Cities site or at an alternate site is considered MODERATE.

- **Waste**

Natural gas firing results in very few combustion by-products because of the clean nature of the fuel. There will be small amounts of solid-waste products (i.e., ash) from burning natural-gas fuel. In the GEIS, the staff concluded that waste generation from natural gas-fired technology would be minimal (NRC 1996). Waste generation at an operating natural gas-fired plant would be largely limited to typical office wastes. Construction-related debris would be generated during construction activities. Overall, the waste impacts would be SMALL for a natural-gas-fired plant sited at the Quad Cities site or at an alternate site.

- **Human Health**

In the GEIS, the staff identifies cancer and emphysema as potential health risks from natural gas-fired plants (NRC 1996). The risk may be attributable to NO<sub>x</sub> emissions that contribute to ozone formation, which, in turn, contributes to health risks. NO<sub>x</sub> emissions from the plant would be regulated. As discussed in Section 8.2.1.1, NO<sub>x</sub> emissions for a new combined-cycle plant at the Quad Cities site would be offset through the Emissions Reduction Trading Program. Human health effects are not expected to be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural gas-fired alternative at the Quad Cities site or at an alternate site are considered SMALL.

- **Socioeconomics**

Construction of a natural-gas-combined facility at the Quad Cities site would take approximately 2 to 3 years. The staff assumed that construction would take place while Quad Cities Units 1 and 2 continued operation and would be completed by the time the units permanently ceased operations. In the GEIS (NRC 1996), the staff concluded that socioeconomic impacts from constructing a natural gas-fired power plant would be low compared to other steam plants.

If the facility were constructed at the Quad Cities site, the number of construction workers would be in addition to the 850 permanent employees and approximately 130 contract workers that currently work at the Quad Cities site. During construction, the communities immediately surrounding the Quad Cities site would experience demands on housing and

public services that would have SMALL impacts. These impacts would be tempered because construction workers would be commuting to the site from a wider range of cities and towns comprising the Quad Cities metropolitan area. After construction, the nearby communities would be impacted by the loss of the construction jobs.

The capital expenditures associated with the new plant would lead to an increase in assessed value and tax revenue that would probably be substantial for several of the small taxing bodies associated with the Cordova Township. Therefore, this alternative would probably have a positive impact in tax revenues. However, even though these new tax revenues would probably more than replace tax revenues lost upon the decommissioning of the current plant, they would not have more than a SMALL effect in terms of tax-related land use effects.

Exelon estimates that the new combined-cycle facility would have a workforce of approximately 25 to 40 (Exelon 2003a), significantly less than the 150 assumed in the GEIS for a 1000-MW(e) natural-gas facility. Assuming a workforce of approximately 50 workers, if the combined-cycle facility were constructed at the Quad Cities site and Quad Cities Units 1 and 2 were decommissioned, there would be a loss of 800 permanent, high-paying jobs (850 for Quad Cities Units 1 and 2 down to 50 for the natural-gas alternative), along with the loss of 130 contract workers, with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. These impacts would be tempered because the Quad Cities site is within the Quad Cities metropolitan area. The natural-gas alternative would provide a new tax base to offset the loss of tax base associated with the decommissioning of Quad Cities Units 1 and 2. For all these reasons, the appropriate characterization of non-transportation socioeconomic impacts for operating a natural-gas plant constructed at the Quad Cities site is considered SMALL.

If the alternative natural gas-fired power plant were constructed at an alternate site, impacts would depend on the socioeconomic characteristics of the new site. If the site were near a large urban center, as the Quad Cities site is, then the impacts would be small. On the other hand, socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction workforce would need to move into the area to work (NRC 1996). Alternate sites would, therefore, need to be analyzed on a case-by-case basis. Socioeconomic impacts from construction of the new site could range from SMALL to MODERATE, depending on the characteristics of the surrounding regions. Impacts from operating the facility would likely be SMALL.

For transportation related to commuting of plant operating personnel, the impacts are considered small. The number of plant operating personnel would be small compared to the current workforce of 850 (Exelon 2003a). Therefore, traffic impacts associated with plant personnel commuting to a natural-gas plant would be expected to be SMALL compared to the current impacts from Quad Cities Units 1 and 2. This would exist for both the Quad Cities site and an alternate site.

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During the construction period for the replacement natural gas-fired units, a significant number of construction workers would be working on the site, in addition to the 850 permanent and 130 contract workers currently at the Quad Cities site. The addition of these workers could place significant traffic loads on existing highways near the Quad Cities site. Such impacts would be **SMALL to MODERATE**. At an alternate site, such impacts are also considered **SMALL to MODERATE**.

- **Aesthetics**

The turbine buildings, the exhaust stacks (approximately 60 m [200 ft] tall), and the gas pipeline compressors would be visible from offsite during daylight hours. Buildings and structures would also be visible at night because of outside lighting. Cooling towers would be required, and these towers and their associated plumes would also be visible offsite. Visual impacts of buildings and structures could be mitigated by landscaping and selecting a color that is consistent with the environment. Visual impacts at night could be mitigated by reduced use of lighting and appropriate use of shielding. At the Quad Cities site, visual aesthetic impacts of a natural gas combined-cycle facility are considered **MODERATE**. At an alternate site, the aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other industrial plants. There would also be significant aesthetic impact from a new transmission line. Overall, the aesthetic impacts associated with a replacement natural gas-fired power plant at an alternate site are considered **MODERATE to LARGE** and will depend on the exact location of the alternate site.

Natural-gas generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a natural gas-fired plant compared to existing operations at the Quad Cities are considered **MODERATE**. At an alternate site, these noise impacts would be **SMALL to LARGE**, depending on the site and location. Again, the aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities.

- **Historic and Archaeological Resources**

At the Quad Cities site or an alternate site, a cultural-resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification, and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Quad Cities site or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-ways). Historic and archaeological resource impacts need to be evaluated on a site-specific basis. The impacts can generally be effectively managed; and as such, impacts would vary between SMALL to MODERATE, depending on what historic and archaeological resources are present, and whether mitigation is necessary.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural gas-fired plant were built at the Quad Cities site. Other impacts, such as impacts on housing availability and prices during construction, might occur, and this could disproportionately affect minority and low-income populations. Closure of Quad Cities Units 1 and 2 would result in a decrease in employment of approximately 850 permanent operating employees and 130 contract employees (same as in the no-action case), offset by construction and operation of the replacement power plant. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, the Quad Cities site is located near an active urban area with many employment possibilities. Overall impacts are expected to be SMALL, and would depend on the ability of minority or low-income populations to commute to other jobs outside the area. The impacts around the alternate site would depend upon the site chosen and the nearby population distribution. These impacts could vary between SMALL and LARGE.

#### **8.2.2.2 Open-Cycle Cooling System**

The environmental impacts of constructing a natural gas-fired generation system at the Quad Cities site using an open-cycle cooling system are largely the same as the impacts for a natural gas-fired plant using a closed-cycle system. However, there are some environmental differences between the closed-cycle and once-through cooling systems. Table 8-5 summarizes these incremental differences.



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**Table 8-5. Summary of Environmental Impacts of Natural Gas-Fired Generation at the Quad Cities Site Using Open-Cycle Cooling**

<b>Impact Category</b>	<b>Change in Impacts from Closed-Cycle Cooling System</b>
Land Use	10 to 12 ha (25 to 30 ac) less land required because cooling towers and associated infrastructure are not needed.
Ecology	Impacts would depend on ecology at the site. No impact to terrestrial ecology from cooling-tower drift. Increased water withdrawal with possible greater impact on aquatic ecology.
Surface Water Use and Quality	No discharge of cooling-tower blowdown. Increased water withdrawal and more thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Aesthetics	Reduced aesthetic impact because cooling towers would not be used.
Historic and Archaeological Resources	Less land impacted.
Environmental Justice	No change.

**8.2.3 Nuclear Power Generation**

Since 1997, the NRC has certified three new standard designs for nuclear power plants under 10 CFR Part 52, Subpart B. These designs are the U.S. Advanced Boiling Water Reactor (10 CFR Part 52, Appendix A), the System 80+ Design (10 CFR Part 52, Appendix B), and the AP600 Design (10 CFR Part 52, Appendix C). All of these plant designs are light-water reactors. Although no applications for a construction permit or a combined license based on these certified designs have been submitted to the NRC, the submission of the design certification applications indicates continuing interest in the possibility of licensing new nuclear power plants. Recent volatility in prices of natural gas and electricity has made new nuclear power plant construction more attractive from a cost standpoint. Additionally, System Energy Resources, Inc., Exelon Generation Company, LLC, and Dominion Nuclear North Anna, LLC, have recently submitted applications for early site permits for new advanced nuclear power plants under the procedures in 10 CFR Part 52, Subpart A (SERI 2003; Dominion 2003; Exelon 2003b). Therefore, construction of a new nuclear plant, either at the Quad Cities site or at an

alternate site in Illinois using both closed and open-cycle cooling, is considered in this section. The staff assumed that the new nuclear plant would have a 40-year lifetime.

The NRC summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs, sited at Quad Cities or an alternate site. The impacts shown in Table S-3 are for a 1000-MW(e) reactor and would need to be adjusted to reflect replacement of Quad Cities Units 1 and 2, which have a net capacity of 1860 MW(e). The environmental impacts associated with transporting fuel and waste to and from a light-water cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. The summary of the NRC's findings on NEPA issues for license renewal of nuclear power plants in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, is also relevant, although not directly applicable, for consideration of environmental impacts associated with the operation of a replacement nuclear power plant. Additional environmental impact information for a replacement nuclear power plant using a closed-cycle cooling is presented in Section 8.2.3.1 and using open-cycle cooling in Section 8.2.3.2.

### 8.2.3.1 Closed-Cycle Cooling System

For purposes of this SEIS, the staff assumed a nuclear plant would use a closed-cycle cooling system at the Quad Cities site. The overall impacts of the nuclear generating system using closed-cycle cooling at the Quad Cities site and at an alternate site are discussed in the following sections and summarized in Table 8-6. For completeness, the staff also considered the impacts of a fully open-cycle cooling system at the Quad Cities site. Additional impacts from the use of an open-cycle cooling system are considered in Section 8.2.1.2.

- **Land Use**

According to the GEIS, a light-water reactor requires approximately 200 to 400 ha (500 to 1000 ac) excluding transmission lines. Exelon believes that the Quad Cities site is adequate to support a new nuclear facility. However, to support a new nuclear facility at the Quad Cities site, it may be necessary to supplement the site with neighboring land. For siting a new facility, the existing infrastructure would be used to the extent practicable, thus limiting the amount of new construction that would be required. Specifically, the staff assumed that the new nuclear facility would use the existing switchyard, offices, intake and discharge, and transmission rights-of-ways.

There would be no net change in land needed for uranium mining because land needed to supply the new nuclear plant would offset the land needed to supply uranium for fueling the existing reactors at Quad Cities Units 1 and 2. Overall, the impact of a replacement nuclear generating plant on land use at the existing Quad Cities site is best characterized as MODERATE.

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**Table 8-6. Summary of Environmental Impacts of New Nuclear Power Generation at the Quad Cities Site and an Alternate Site Using Closed-Cycle Cooling**

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Land Use	MODERATE	Would use unused portion of Quad Cities site, possibly supplemented with neighboring land. Would require approximately 200 to 400 ha (500 to 1000 ac). Existing infrastructure (e.g., transmission lines) used.	MODERATE to LARGE	Same as Quad Cities site, plus land for transmission line and any existing infrastructure. Total impact would depend on whether the alternate site is previously disturbed.
Ecology	SMALL to MODERATE	Would use undeveloped areas at Quad Cities site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	MODERATE to LARGE	Impact would depend on whether site is previously developed. Factors to consider include location and ecology of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.
Water Use and Quality	SMALL	Would use closed-cycle cooling system, reducing cooling water requirements while increasing evaporative, consumptive use and new heat rejection to the atmosphere, and continues very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, and the characteristics of surface water or groundwater source.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction. Small amount of emissions from diesel generators and possibly other sources during operation. Emissions would be similar to current releases at Quad Cities Units 1 and 2.	SMALL	Same impacts as at Quad Cities.
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as at Quad Cities.

Table 8-6. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Appendix B, Table B-1.	SMALL	Same impacts as for Quad Cities site.
Socioeconomics	SMALL to MODERATE	<p>During construction, impacts would be SMALL to MODERATE. Upwards of 2500 workers might be required at peak of the five-year construction period.</p> <p>During operation, employment would be similar to current employment. Tax base would be preserved.</p> <p>Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.</p>	SMALL to LARGE	<p>Construction impacts at alternate site would be similar to those at Quad Cities site, but would depend on whether new site is located near a major metropolitan area.</p> <p>Minimal impacts on local tax base.</p> <p>Transportation impacts would be similar to those at the Quad Cities site.</p>
Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant buildings and structures, along with noise impacts from plant operation. Visual impact would be similar to current Quad Cities Units 1 and 2.	MODERATE to LARGE	Impacts would be similar to those at Quad Cities site, but would also include any aesthetic impacts from building new transmission lines.
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped or developed site.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped site.

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**Table 8-6. (contd)**

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities should be similar to those experienced by the population as a whole.	SMALL to LARGE	Impacts vary depending on population distribution and characteristics at new site. Impacts on Quad Cities site would be identical to those in the no-action alternative.

Land-use requirements at an alternate site would be approximately 200 to 400 ha (500 to 1000 ac) plus the possible need for land for a new transmission line (NRC 1996). In addition, it may be necessary to construct a rail spur or barge offloading facility to an alternate site to deliver equipment during construction. Depending on new transmission-line routing, siting a new nuclear power plant at an alternate site could result in MODERATE to LARGE land-use impacts.

- **Ecology**

Locating a new nuclear power plant at the Quad Cities site would alter ecological resources because of the need to convert currently unused land to industrial use. However, some of this land would have been previously disturbed. Use of a closed-cycle cooling system would reduce water needs below their current levels. There could be potential habitat degradation, fragmentation or loss, reduced ecological productivity and a reduction in biological diversity resulting from disturbing previously intact land. Siting a new nuclear power plant at the Quad Cities site would have a SMALL to MODERATE ecological impact that would be greater than renewal of the OLs due to the construction impacts.

At an alternate site, the new nuclear power alternative would introduce construction impacts and comparable operational impacts. Even assuming siting at a previously disturbed area, the impacts may alter the ecology. Impacts could include habitat degradation, fragmentation, or loss, reduced ecological productivity and a reduction in biological diversity. If needed, construction and maintenance of a transmission line would have similar ecological impacts. If the site had been previously developed, the impact would be MODERATE and if the site was undeveloped, the impact would be MODERATE to LARGE.

- **Water Use and Quality**

The nuclear alternative at the existing site or at an alternate site would use a closed-cycle cooling system instead of the current practice of using open-cycle cooling, and would,

therefore, decrease cooling-water needs. Plant discharges would consist mostly of cooling-tower blowdown, characterized primarily by an increased temperature and increased concentration of dissolved salts relative to the receiving body of water and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary waste water may also be discharged. All discharges would likely be regulated through a NPDES permit. The five groundwater wells that supply limited specific uses at the Quad Cities site could continue to be used. Some erosion and sedimentation probably would occur during construction (NRC 1996). At an alternate site, the cooling water would likely be drawn from a surface body of water. Use of groundwater for a nuclear plant at an alternate site is a possibility. Some erosion and sedimentation probably would occur during construction (NRC 1996). Overall, the impacts of the nuclear alternative at the Quad Cities site are considered **SMALL**. Overall, the impacts at an alternate site are considered **SMALL** to **MODERATE** depending on the location.

- **Air Quality**

Construction of a new nuclear plant at the Quad Cities site or an alternate site would result in fugitive emissions during the construction process. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process. An operating nuclear plant would have minor air emissions associated with emergency diesel generators. These emissions would be regulated. Overall, emissions and associated impacts are considered **SMALL**.

- **Waste**

The waste impacts associated with the operation of a nuclear power plant are set out in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. In addition to the impacts shown in Table B-1, construction-related debris would be generated during construction activities and would be removed to an appropriate disposal site. Overall, waste impacts are considered **SMALL** at either the Quad Cities site or an alternate site.

- **Human Health**

Human health impacts for an operating nuclear power plant are set out in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. Overall, human health impacts are considered **SMALL** at either the Quad Cities site or at an alternate site.

- **Socioeconomics**

The construction period and the peak workforce associated with the construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantified data, the staff assumed a construction period of 5 years and a peak workforce of 2500. The staff assumed that construction would take place while Quad Cities Units 1 and 2

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continues operation and would be completed by the time Quad Cities Units 1 and 2 permanently cease operations.

If the facility were constructed at the Quad Cities site, the number of construction workers would be in addition to the 850 permanent employees and approximately 130 contract workers that currently work at the Quad Cities site. During construction of the new nuclear power plant, the surrounding communities would experience demands on housing and public services that could have MODERATE impacts. These impacts would be tempered because the Quad Cities site is part of the Quad Cities metropolitan area. After construction, the nearby communities would be impacted by the loss of the construction jobs.

The replacement nuclear units are assumed to have an operating workforce comparable to the approximately 1000 workers currently working at Quad Cities Units 1 and 2. The new nuclear power plant alternative would provide a new tax base to offset the loss of tax base associated with decommissioning Quad Cities Units 1 and 2. For all these reasons, the appropriate characterization of non-transportation socioeconomic impacts for operating a new nuclear power plant constructed at the Quad Cities site is considered SMALL.

The capital expenditures associated with the new plant would lead to an increase in assessed value and tax revenue that would probably be substantial for several of the small taxing bodies in the Cordova Township. Therefore, this alternative would probably have a positive impact in tax revenues. However, even though these new tax revenues would probably more than replace tax revenues lost upon the decommissioning of the current plant, they would not have more than a SMALL effect in terms of tax-related land use effects.

The impacts around the alternate site would depend on the socioeconomic characteristics of the new site. If the site were near a large urban center, as the Quad Cities site is, then the impacts would be SMALL. On the other hand, in the GEIS, the staff stated that the socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction workforce would need to move into the area to work (NRC 1996). Alternate sites would, therefore, need to be analyzed on a case-by-case basis. Socioeconomic impacts from construction of the new site could range from SMALL to LARGE, depending on the characteristics of the surrounding regions.

For transportation related to commuting of plant-operating personnel, the impacts are considered small. The number of personnel would be similar to the number currently working at the Quad Cities site. Therefore, traffic impacts associated with plant personnel commuting to a new nuclear power plant would be expected to be SMALL compared to the current impacts from Quad Cities Units 1 and 2. This would hold for both the Quad Cities site and an alternate site.

During the 5-year construction period for the replacement new nuclear power plant, a large number of construction workers would be working at the site, in addition to the workers currently at the Quad Cities site. The addition of these workers could place significant traffic loads on existing highways near either the Quad Cities site or an alternate site. Such impacts would be MODERATE.

- **Aesthetics**

The containment buildings and other associated buildings required for a replacement nuclear power plant sited at Quad Cities would be visible in daylight hours. Buildings and structures would also be visible at night because of outside lighting. Cooling towers would be required and these towers and their associated plumes would also be visible offsite. Visual impacts of buildings and structures could be mitigated by landscaping and selecting a color that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. At the Quad Cities site, visual aesthetic impacts are considered MODERATE. At an alternate site, the aesthetic impacts could be mitigated if the plant were located in an industrial area adjacent to other power plants. There would also be significant aesthetic impacts from a new transmission line. Overall, the aesthetic impacts associated with a replacement nuclear-fired power plant at an alternate site are considered MODERATE to LARGE and will depend on the exact location of the alternate site.

Nuclear generation would introduce mechanical sources of noise that would be audible offsite. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the use of outside loudspeakers and the commuting of plant employees. The incremental noise impacts of a nuclear-fired plant compared to existing operations at the Quad Cities site are considered to be MODERATE. At an alternate site, these noise impacts would be SMALL to LARGE, depending on the site. Again, aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities.

- **Historic and Archaeological Resources**

At the Quad Cities site or an alternate site, a cultural-resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification, and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at the Quad Cities site or an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant



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construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-ways). Historic and archaeological resource impacts need to be evaluated on a site-specific basis. The impacts can generally be effectively managed, and as such, impacts would vary between SMALL to MODERATE, depending on what historic and archaeological resources are present, and whether mitigation is necessary.

- **Environmental Justice**

No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a new nuclear power plant were built at the Quad Cities site. Other impacts, such as impacts on housing availability and prices during construction, might occur during construction, and this could disproportionately affect minority and low-income populations. Closure of Quad Cities Units 1 and 2 would result in a decrease in employment of approximately 850 permanent operating employees and 130 contract employees (same as in the no-action case), but this would be offset by construction and operation of the replacement power plant. Resulting economic conditions could reduce employment prospects for minority or low-income populations. However, the Quad Cities site is located near an active urban area with many employment possibilities. Overall, impacts would be SMALL and would depend on the ability of minority or low income populations to commute to other jobs outside the area. The impacts around the alternate site would depend upon the site chosen and the nearby population distribution. These impacts could vary between SMALL and LARGE.

### 8.2.3.2 Open-Cycle Cooling System

The environmental impacts of constructing a nuclear generation system at the Quad Cities site using an open-cycle cooling system are largely the same as the impacts for a nuclear generation system using a closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences. This section discusses the environmental impacts of constructing a nuclear power plant at an alternate site using closed-cycle cooling. The impacts of this option are essentially the same as the impacts for a nuclear power plant using once-through cooling. However, there are minor environmental differences between the closed-cycle and once-through cooling systems. Table 8-7 summarizes the incremental differences.

**Table 8-7. Summary of Environmental Impacts of a New Nuclear Power Plant at Quad Cities Site Using Open-Cycle Cooling**

Impact Category	Change In Impacts from Closed-Cycle Cooling System
Land Use	10 to 12 ha (25 to 30 ac) less land required because cooling towers and associated infrastructure are not needed.
Ecology	Impacts would depend on ecology at the site. No impact to terrestrial ecology from cooling-tower drift. Increased water withdrawal with possible greater impact on aquatic ecology.
Surface Water Use and Quality	No discharge of cooling-tower blowdown. Increased water withdrawal and more thermal load on receiving body of water.
Groundwater Use and Quality	No change.
Air Quality	No change.
Waste	No change.
Human Health	No change.
Socioeconomics	No change.
Aesthetics	Reduced aesthetic impact because cooling towers would not be used.
Historic and Archaeological Resources	Less land impacted.
Environmental Justice	No change.

**8.2.4 Purchased Electrical Power**

This section considers the option of Exelon decommissioning Quad Cities Units 1 and 2, not replacing the lost generation with a new power plant or other option, and then purchasing an equal amount of power and capacity to replace that generated by Quad Cities Units 1 and 2. There are two possibilities for the source of this power. It could come from facilities that are already built but not producing power. Alternatively, it could come from new generation facilities. The likely outcome would be a combination of both sources. Initially, replacement power would come from existing sources. Under normal economic conditions, this will raise the price of capacity and energy because supply will be lowered while demand will remain the same. Over time, this increase in price will spur new generation capacity to take advantage of the new opportunities for profit. In this case, the new generation could be attributed to a mix of sources, most likely natural gas- and coal-fired generation, which were discussed above. If there were significant excess supply in the U.S., then it might be the case that no new generation would be brought online to replace the lower supply. No such excess supply condition exists in the Eastern Grid, of which Illinois is a part.

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According to DOE/EIA, in 2001, the reserve margin<sup>(a)</sup> in the Eastern Grid was 13.9 percent in 2001, well below the traditional levels of 25 to 30 percent (DOE/EIA 2003b). No such excess supply condition exists in the Eastern Grid of which Illinois is a part.

In a traditional regulated utility environment, utilities manage all portions of the utility system from generation to transmission to distribution. In this environment, utilities buy and sell power from other utilities to make up for any shortfalls in demand or excess of generation capacity. However, Illinois, like many states, has altered the regulation of their electric utilities so that generation is decoupled from transmission and distribution. Generators sell power and energy as commodities. While Exelon holds both generation and distribution companies, these companies are not linked in the traditional fashion. Exelon generation can sell to any distributor and Exelon distribution can purchase from any generator. Exelon's generating arm could purchase and then sell the electricity, but this would not change supply or demand, it would simply add a middle-man in the electricity market.

For these reasons, the staff does not believe that purchasing power to make up for the generation at Quad Cities Units 1 and 2 is a meaningful alternative that requires independent analysis. Any impacts from purchasing power in the open market will follow those of the generation sources that end up supplying the power, which are covered in other sections in this chapter.

### 8.2.5 Other Alternatives

Other generation technologies considered by the NRC are discussed in the following subsections. The staff felt that none of these options alone was sufficient to replace the capacity and energy of Quad Cities Units 1 and 2. However, such alternatives might be used in combination, as is discussed in Section 8.2.6.

#### 8.2.5.1 Oil-Fired Generation

The EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States through the year 2020 because of higher fuel costs and lower efficiencies (DOE/EIA 2001a). Oil-fired operation is more expensive than nuclear or coal-fired operation. Future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline in its use for electricity generation. Increasing domestic concerns over oil security will only exacerbate the move away from oil-fired electricity generation. Therefore, the staff does not consider oil-fired generation, by itself, a feasible alternative to Quad Cities Units 1 and 2.

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(a) The reserve margin is defined as excess available capacity as a fraction of total demand at a given time.

### 8.2.5.2 Wind Power

According to the DOE (2003), Illinois has a capacity of approximately 3000 MW(e) of Class 4 wind sites. In addition, there are 6000 MW(e) of Class 3+ sites. Class 3+ sites might prove economically viable for wind generation with near-term technological advances. Wind power plants typically run at capacity factors of 30 to 35 percent (Northwest Power Planning Council [NWPPC] 2000). These capacity factors are much lower than those for a nuclear power plant, which commonly run above 90 percent. Therefore, approximately 4200 to 4900 MW(e) would have to be developed to make up for the approximately 13 billion kWh(e) generated by Quad Cities Units 1 and 2 in 2001 (DOE/EIA 2003c). Because the largest, commercially available wind turbines are in the range of 1 MW to 1.5 MW, approximately 2800 to 4900 of these turbines would be required to replace the generation from Quad Cities Units 1 and 2.

Although the wind resource in Illinois, in theory, is sufficient to support replacement of the capacity and energy from Quad Cities Units 1 and 2, many difficulties render full replacement a problematic option. For one, the vast bulk of the wind resource would have to be developed; and this development would be an enormously extensive undertaking, especially when one considers that total wind power capacity in the United States at the end of 2002 was approximately 4500 MW. Although wind power production in the United States is expected to grow many times over the coming decades, installation of approximately 4200 MW to 4900 MW in the Midwest to replace the generation from Quad Cities Units 1 and 2 would require approximately near-term doubling of current U.S. wind generation capacity. Further, access to many of the best wind power sites would require easements, extensive road building and, potentially, extensive clearing (for towers and blades). Construction of thousands of wind turbines in Illinois would also require extensive construction of transmission lines to bring the power and the energy to market. Wind energy is an intermittent resource, whereas Quad Cities Units 1 and 2 provide constant baseload power. When there is little wind, wind energy simply would not compensate for Quad Cities Units 1 and 2 energy production. For all these reasons, the staff concludes that wind power alone is not a feasible substitute at this time for the baseload generation from Quad Cities Units 1 and 2.

Wind power could be included in a combination of alternatives to replace Quad Cities Units 1 and 2. The environmental impacts of a large-scale wind farm are described in NUREG-1437, Section 8.3. The construction of roads, transmission lines, and turbine tower supports would result in short-term impacts, such as increases in erosion and sedimentation, and decreases in air quality from fugitive dust and equipment emissions. Construction in undeveloped areas would have the potential to disturb and impact cultural resources or habitat for sensitive species. During operation, some land near wind turbines could be available for compatible uses such as agriculture. The continuing aesthetic impact would be considerable, and there is a potential for bird collisions with turbine blades. Wind farms generate very little waste and pose no human health risk other than from occupational injuries.

### 8.2.5.3 Solar Power

Solar technologies use the sun's energy and light to provide heat and cooling, light, hot water, and electricity for homes, businesses, and industry. Solar-power technologies, both photovoltaic (PV) and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to higher capital costs per kilowatt of capacity. The average capacity factor of photovoltaic cells is about 25 percent (NRC 1996), and the capacity factor for solar thermal systems is about 25 to 40 percent (NRC 1996). These capacity factors are low because solar power is an intermittent resource, providing power when the sun is strong, whereas Quad Cities Units 1 and 2 provide constant base-load power. Solar technologies simply cannot make up for the capacity from Quad Cities Units 1 and 2 when the sun is not shining.

There are substantial impacts to natural resources (ecological, land-use, and aesthetic impacts) from the construction of solar-generating facilities. As stated in the GEIS, land requirements are high—140 km<sup>2</sup> (55 mi<sup>2</sup>) per 1000 MW for photovoltaic and approximately 57 km<sup>2</sup> (22 mi<sup>2</sup>) per 1000 MW for solar thermal systems (NRC 1996). Neither type of solar electric system would fit at the Quad Cities site, and both would have large environmental impacts at an alternate site.

Currently available PV cell conversion efficiencies range from approximately 7 to 17 percent. The average solar energy falling on a horizontal surface in the Illinois region in June, a peak month for sunlight, is approximately 6.0 to 6.5 kWh/m<sup>2</sup> per day. If an average solar energy flux throughout the year of approximately 3 kWh/m<sup>2</sup> per day (Exelon 2003a) and a conversion efficiency of 10 percent are assumed, PV cells would yield an annual electricity production of approximately 110 kWh(e)/m<sup>2</sup> per year in Illinois. At this assumed rate of generation, replacing the 13 billion kWh generated in 2001 by Quad Cities Units 1 and 2 (DOE/EIA 2003c) would require approximately 120 million m<sup>2</sup> or 120 km<sup>2</sup> (46 mi<sup>2</sup>) of PV arrays. Because of the area's low rate of solar radiation, the high technology costs, and the intermittent nature of the resource, solar power is limited to niche applications and is not a feasible baseload alternative to license renewal of Quad Cities Units 1 and 2.

Installations of solar panels on residential and commercial rooftops are referred to as "distributed solar power." Based on an average house size of 139 m<sup>2</sup> (1500 ft<sup>2</sup>) with a usable roof space of 70 m<sup>2</sup> (753 ft<sup>2</sup>) and a higher conversion efficiency of 15 percent, over 1 million new or existing homes would have to be fitted with solar panels to replace the generation from Quad Cities Units 2 and 3. Without significant government or utility incentives, installation of distributed solar panels on this scale is unlikely. However, distributed solar power could be included in a combination of alternatives to replace Quad Cities. Distributed solar power would result in fewer construction-related impacts because solar panels would usually be placed on existing buildings, eliminating the need for land clearing or transmission lines. Aesthetic impacts would be only marginally greater than those already created by the existing or new buildings. Impacts from the manufacture of solar panels would still occur.

Solar power could, however, be included in a combination of alternatives to replace Quad Cities Units 1 and 2. The potential environmental impacts associated with a large scale solar generation facility and transmission lines are described in NUREG-1437, Section 8.3. The construction impacts would be similar to those associated with a large wind farm as discussed in Section 8.2.5.2. The operating facility would also have considerable aesthetic impact. Solar installations pose no human health risk other than from occupational injuries. The manufacturing process for constructing a large amount of PV cells would result in waste generation, but this waste generation has not been quantified.

#### **8.2.5.4 Hydropower**

Less than 0.1 percent of Illinois electricity-generating capacity and its electricity generation come from hydroelectric power (DOE/EIA 2003a). As stated in Section 8.3.4 of the GEIS, Hydropower's percentage of the country's generating capacity is expected to decline because hydroelectric facilities have become difficult to site as a result of public concern over flooding, destruction of natural habitat, and alteration of natural river courses. According to the U.S. Hydropower Resource Assessment for Illinois (INEEL 1997), there is only 301 MW of undeveloped hydroelectric capacity in Illinois, far below that required to replace the 1860 MW(e) of Quad Cities Units 1 and 2.

The staff estimated in the GEIS that land requirements for hydroelectric power are approximately 400,000 ha (1 million ac or approximately 1600 mi<sup>2</sup>) per 1000 MW. This requirement would need to be adjusted proportionately upward to meet the requirements of Quad Cities Units 1 and 2. This would result in a large impact on land use, most of which would be out of State because of Illinois' limited hydroelectric potential. Further, operation of a hydroelectric facility would alter aquatic habitats above and below the lock and dam, which would impact existing aquatic species. Due to the relatively low amount of undeveloped hydropower resource in Illinois and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to replace Quad Cities Units 1 and 2, the staff concludes that local hydropower is not a feasible alternative to Quad Cities Units 1 and 2 OL renewal.

#### **8.2.5.5 Geothermal Energy**

Geothermal energy has an average capacity factor of 90 percent and can be used for base-load power where available. However, geothermal technology is not widely used as base-load generation due to the limited geographical availability of the resource and the immature status of the technology (NRC 1996). As illustrated by Figure 8.4 in the GEIS, geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent. There is no feasible eastern location for geothermal capacity to serve as an alternative to Quad Cities Units 1 and 2. The staff concludes that geothermal energy is not a feasible alternative to renewing the Quad Cities Units 1 and 2 OLs.

#### **8.2.5.6 Wood Waste**

A wood-burning facility can provide base-load power and can operate with an average annual capacity factor of around 70 to 80 percent and with 20 to 25 percent efficiency (NRC 1996). The fuels required are variable and site-specific. A significant barrier to the use of wood waste to generate electricity is the high delivered-fuel cost and high construction cost per MW of generating capacity. The larger wood-waste power plants are only 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impact per MW of installed capacity should be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales (NRC 1996). Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

Due to uncertainties associated with obtaining sufficient wood and wood waste to fuel a base-load generating facility, the ecological impacts of large-scale timber cutting (e.g., soil erosion, reduction of biodiversity, habitat degradation, fragmentation and loss), and high inefficiency, the staff has determined that wood waste is not a feasible alternative to renewing the Quad Cities Units 1 and 2 OLS.

#### **8.2.5.7 Municipal Solid Waste**

Municipal waste combustors incinerate the waste and use the resultant heat to generate steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight of the waste by up to 75 percent (EPA 2001b). Municipal waste combustors use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001b). Mass-burning technologies are most commonly used in the United States. This group of technologies process raw municipal solid waste "as is," with little or no sizing, shredding, or separation before combustion. Because of the need for specialized waste-separation and handling equipment for municipal solid waste, the initial capital costs for municipal solid-waste plants are greater than for comparable steam-turbine technology at wood-waste facilities (NRC 1996).

Growth in the municipal waste-combustion industry slowed dramatically during the 1990s after rapid growth during the 1980s. The slower growth was due to three primary factors: (1) the Tax Reform Act of 1986, which made capital-intensive projects such as municipal waste-combustion facilities more expensive relative to less capital-intensive, waste-disposal alternatives such as landfills; (2) the 1994 Supreme Court decision *C & A Carbone, Inc. vs. Town of Clarkstown*, which struck down local flow-control ordinances that required waste to be delivered to specific municipal waste-combustion facilities rather than landfills that may have had lower fees; and (3) increasingly stringent environmental regulations that increased the capital cost necessary to construct and maintain municipal waste-combustion facilities (DOE/EIA 2001b).

Municipal solid-waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to the portion of unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue-gases using fabric filters and/or scrubbers (DOE/EIA 2001b).

Currently, there are approximately 102 waste-to-energy plants operating in the United States. These plants generate approximately 2800 MW(e), or an average of approximately 28 MW(e) per plant (Integrated Waste Services Association 2001), much smaller than the amount needed to replace the 1826-MW(e) base-load capacity of Quad Cities Units 1 and 2. Therefore, the staff concludes that municipal solid waste would not be a feasible alternative to renewal of the Quad Cities Units 1 and 2 OLS, particularly at the scale required.

#### **8.2.5.8 Other Biomass-Derived Fuels**

In addition to wood and municipal solid-waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the staff stated that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a base-load plant such as Quad Cities Units 1 and 2 (NRC 1996). For these reasons, such fuels do not offer a feasible alternative to renewing the Quad Cities Units 1 and 2 OLS.

#### **8.2.5.9 Fuel Cells**

Fuel cells work without combustion and its local environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air over a cathode and separating the two by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. It can also be produced from electricity using electrolysis. Phosphoric acid fuel cells are the most mature fuel cell technology, but they are only in the initial stages of commercialization. Phosphoric acid fuel cells are generally considered first-generation technology. These are commercially available today at a cost of approximately \$4500 per kilowatt of installed capacity (DOE 2002). Higher-temperature, second-generation fuel cells achieve higher fuel-to-electricity and thermal efficiencies. The higher temperatures contribute to improved efficiencies and give the second-generation fuel cells the capability to generate steam for co-generation and combined-cycle operations.

DOE has a performance target that in 2003, two second-generation, fuel-cell technologies using molten-carbonate and solid-oxide technology, respectively, will be commercially available in sizes of approximately 3 MW at a cost of \$1000 to \$1500 per kW of installed capacity (DOE 2002). For comparison, the installed capacity cost for a natural gas-fired combined-cycle plant is on the order of \$500 to \$600 per kW (NWPPC 2000). As market acceptance and manufacturing capacity increase, natural-gas-fueled, fuel-cell plants in the 50- to 100-MW



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range are projected to become available (DOE 2002). At the present time, however, fuel cells are not economically or technologically competitive with other alternatives for base-load electricity generation. Fuel cells are, consequently, not a feasible alternative to renewing the Quad Cities Units 1 and 2 OLS.

### 8.2.5.10 Delayed Retirement

Exelon has no plans for retiring any reactors in its fleet of nuclear plants and expects to need additional capacity in the near future (Exelon 2003a). Further, Exelon indicates that any fossil plants slated for retirement tend to use less efficient generation and pollution control technologies. With more stringent environmental restrictions, the impact of delaying retirement of a fossil fuel plant to compensate for the loss of electricity from Quad Cities Units 1 and 2 would be bounded by the impacts for the natural gas and coal-fired alternatives, and would potentially be more severe because of the less efficient pollution control equipment from older plants. The staff, therefore, concluded that delayed retirement of other Exelon generating units could not provide a replacement of the power supplied by Quad Cities Units 1 and 2 and could not be a feasible alternative to Quad Cities Units 1 and 2 license renewal.

### 8.2.5.11 Utility-Sponsored Conservation

The utility-sponsored conservation alternative refers to a situation in which Quad Cities Units 1 and 2 cease to operate, no new generation is brought online to meet the lost generation, and the lost generation is instead replaced by more efficient use of electricity. More efficient use would arise from utility-sponsored conservation programs, potentially including energy audits, incentives to install energy-efficient equipment, and informational programs to inform electricity consumers of the benefits of, and possibilities for, electricity conservation. There are two reasons to believe that conservation is not an appropriate alternative to the energy and capacity provided by Quad Cities Units 1 and 2.

The first reason is the potential that the supply of cost-effective energy conservation measures, above and beyond what is already planned, may not be large enough to replace the energy and capacity of Quad Cities Units 1 and 2. While it is possible, for example with large incentives, to decrease usage of electricity to meet the lost generation, it is the cost of such measures that ultimately matters. If the costs are high, for example, significantly higher than the costs of coal-fired or natural gas-fired generation or new nuclear generation, then it is infeasible to consider such measures as a replacement for Quad Cities Units 1 and 2. Hence, the feasibility of the utility-sponsored conservation alternative hinges largely on the costs of reducing demand, which will increase with the level of demand reduction. The cost of these measures has been under debate for many years. One estimate of utility demand-side management (DSM) programs in 1992 gave an average cost of \$0.040/kWh in 1992 dollars (Eto, et al. 1996), more than competitive with new generation. However, others have argued that if such measures are this cost-effective, consumers would undertake them irrespective of utility programs, so such cost estimates must understate full consumer costs. Regardless, replacing the capacity and energy from Quad Cities Units 1 and 2 would require a significant increase in the magnitude

and energy conservation in the U.S. According to the EIA (DOE/EIA 2001c), the sum of all large, electric-utility energy conservation programs up through 2000 saved approximately 54,000 million kWh(e) in 2000. In 2001, Quad Cities Units 1 and 2 provided approximately 12,500 million kWh of electricity (DOE/EIA 2003c). Hence, to replace the lost generation at Quad Cities Units 1 and 2 would require an increase of over 25 percent in the total effect of large-utility sponsored conservation since the time that utilities have been reporting these numbers to the EIA. Such an increase would clearly increase the cost of energy conservation by moving beyond the more cost-effective measures.

The second reason that energy-conservation might not be an effective replacement for Quad Cities Units 1 and 2 involves the changing regulatory structure of the electric-utility industry. Even if it were cost-effective to replace the capacity from Quad Cities Units 1 and 2 using energy conservation, the regulatory structure in Illinois largely eliminates any incentive for Exelon to do so unilaterally. In a traditional, regulated utility environment, utilities managed all portions of the utility system from generation to transmission to distribution. In this environment, it was feasible for utilities to invest in energy-efficiency programs because they could, in many states, receive reimbursement through changes in their electricity rates. However, Illinois, like many states, has altered the regulation of their electric utilities so that generation is decoupled from transmission and distribution. Generators sell power and energy as commodities. While Exelon holds both generation and distribution companies, these companies are not linked in the traditional fashion. Exelon's generating organization can sell to any distributor and Exelon distribution can purchase from any generator. Generation companies will not be reimbursed for energy-efficiency investments, making such investments infeasible from the perspective of the stockholder. Exelon's generating organization will not be able to offer competitively priced power if it subsidizes demand reduction alternatives. Any energy-efficiency investments would, therefore, need to come from other sources not associated with Exelon, for example, state-sponsored energy-efficiency programs.

For the two reasons stated above—that the costs of electricity reduction may be too high to cost-effectively replace Quad Cities Units 1 and 2 and that it is out of the purview of Exelon to bring about these reductions—the staff does not consider energy efficiency, by itself, as a feasible alternative to license renewal. However, conservation could be considered in combination with other alternatives to replace Quad Cities Units 1 and 2. Accordingly, the combination of alternatives discussed in Section 8.2.6 includes 300 MW(e) of energy conservation.

### **8.2.6 Combination of Alternatives**

Should the OLs not be renewed, the lost energy and capacity would be replaced by a combination of more than one, and perhaps many of the alternatives discussed thus far. As discussed in Section 8.2, Quad Cities Units 1 and 2 have a combined net summer rating of 1826 MW(e).

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There are many possible combinations of alternatives. Some alternatives could include renewable energy sources, such as wind or solar power. Table 8-8 contains a summary of the environmental impacts of an assumed combination of alternatives consisting of 1100 MW(e) of generation from a combined-cycle facility at the Quad Cities site, 300 MW(e) of energy conservation, and 429 MW(e) purchased from other generators. The impacts associated with the combined-cycle natural gas-fired units are based on the gas-fired generation impact assumptions discussed in Section 8.2.2, adjusted for the reduced generation capacity. While the DSM measures would have few environmental impacts, operation of the new natural gas-fired plant would result in increased emissions and environmental impacts. The environmental impacts associated with power purchased from other generators would still occur but would be located elsewhere within the region or nation, as discussed in Section 8.2.4. The environmental impacts associated with purchased power are not shown in Table 8-8. The staff concludes that it is very unlikely that the environmental impacts of any reasonable combination of generating and conservation options could be reduced to the level of impacts associated with renewing the Quad Cities Units 1 and 2 OLS.

**Table 8-8. Summary of Environmental Impacts of an Assumed Combination of Generation and Acquisition Alternatives**

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Land Use	SMALL to MODERATE	Upward of 30 ha (75 ac) for power block, offices, roads, and parking areas. Additional impact for construction of underground gas pipeline.	SMALL to LARGE	Same as for Quad Cities site with addition of transmission lines.
Ecology	SMALL to MODERATE	Would use undeveloped areas at Quad Cities site. There would be potential for significant habitat loss and fragmentation and reduced productivity and biological diversity.	SMALL to LARGE	Impact would depend on whether site is previously developed. Factors to consider include location and ecology of site and transmission line route. There would be potential for habitat loss and fragmentation and reduced productivity and biological diversity.

Table 8-8. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Water Use and Quality	SMALL	Would use closed-cycle cooling system with natural gas combined cycle units. This would result in a significant reduction in cooling water requirements. Facility would continue very limited groundwater use.	SMALL to MODERATE	Impact would depend on volume of water withdrawal, the constituents of the discharge water, the characteristics of surface water or groundwater source, and the new intake structures required.
Air Quality	MODERATE	<p>Sulfur oxides</p> <ul style="list-style-type: none"> <li>• 81 MT/yr (89 tons/yr)</li> </ul> <p>Nitrogen oxides</p> <ul style="list-style-type: none"> <li>• 257 MT/yr (284 tons/yr).</li> </ul> <p>Actual impact would depend on emissions offsets.</p> <p>Carbon monoxide:</p> <ul style="list-style-type: none"> <li>• 53 MT/yr (59 tons/yr) PM<sub>10</sub></li> </ul> <p>Particulates</p> <ul style="list-style-type: none"> <li>• 49 MT/yr (54 tons/yr) PM<sub>10</sub></li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• CO<sub>2</sub> emissions contribute to global warming</li> </ul>	MODERATE	Same emissions as at Quad Cities site, although offsets for NO <sub>x</sub> would depend on location.
Waste	SMALL	Minimal waste product from fuel combination.	SMALL	Impacts identical to those for Quad Cities site.
Human Health	SMALL	Impacts considered minor.	SMALL	Impacts identical to those for Quad Cities site.

Alternatives

Table 8-8. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL. Peak workforce during two-to-three year construction period would be significantly smaller than for other steam generation facilities.	SMALL to MODERATE	Construction impacts at alternate site would be similar to those at Quad Cities site, but would depend on whether new site is located near a major metropolitan area.
		During operation, employment would be decreased from approximately 1000 permanent and contract employees to less than 100. All employment impacts would be tempered by proximity to Davenport-Moline-Rock Island, Iowa-Illinois Metropolitan Area. Tax base would be preserved.		Minimal impacts on local tax base.
		Transportation impacts during operation would be SMALL due to the smaller workforce. Transportation impacts associated with construction workers would be SMALL to MODERATE.		Transportation impacts would be similar to those at the Quad Cities site.
Aesthetics	MODERATE	MODERATE aesthetic impact due to impact of plant buildings and structures, along with noise impacts from plant operation. Visual impact would be similar to current Quad Cities Units 1 and 2.	MODERATE	Impact would depend on location. Greatest impact likely would be from the new transmission line(s) that would be needed.
Historic and Archaeological Resources	SMALL to MODERATE	Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped or developed site.	SMALL to MODERATE	Alternate location would necessitate cultural studies. Studies would likely be needed to identify, evaluate, and address mitigation of the potential cultural resource impacts from construction of a new plant on an undeveloped site.

Table 8-8. (contd)

Impact Category	Quad Cities Site		Alternate Site	
	Impact	Comments	Impact	Comments
Environmental Justice	SMALL	No environmental pathways or locations have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations. Impacts on minority and low-income communities would be similar to those experienced by the population as a whole. Any impacts would be tempered by proximity to Davenport-Moline-Rock Island, Iowa-Illinois Metropolitan Area.	SMALL to LARGE	Impacts would vary depending on population distribution and characteristics at new site. Impacts on Quad Cities site would be identical to those in the no-action alternative.

### 8.3 Summary of Alternatives Considered

This chapter considered the alternative actions, (i.e., the no-action alternative [discussed in Section 8.1], new generation alternatives [from coal, natural gas, and nuclear discussed in Sections 8.2.1 through 8.2.3, respectively], purchased electrical power [discussed in Section 8.2.4], alternative technologies [discussed in Section 8.2.5], and the combination of alternatives [discussed in Section 8.2.6]).

The no-action alternative would result in decommissioning Quad Cities Units 1 and 2 and would have SMALL environmental impacts for all impact categories. The no-action alternative is a conceptual alternative resulting in a net reduction in electricity generation; there will be no replacement power, and, therefore, no environmental impacts from replacement power. In actual practice, the power lost by not renewing the OLS for Quad Cities Units 1 and 2 would likely be replaced by (1) demand-side management (DSM) and energy conservation, (2) electricity generated from other sources, either be Exelon or by another generator, or (3) some combination of these alternatives. Any replacement power would produce environmental impacts in addition to those discussed under the no-action alternative.

For each of the new generation alternatives (coal, natural gas, and nuclear), the environmental impacts would not be less than the impacts of license renewal. For example, the air quality impacts from a coal-fired or natural gas-fired facility would be greater than the impacts of continued operation of Quad Cities Units 1 and 2. The impacts of purchased electrical power would still occur, but they would occur elsewhere, and the notion of purchased power is confused by changes in the electricity regulatory structure in Illinois. Alternative technologies are not considered feasible at this time, and it is very unlikely that the environmental impacts of

any reasonable combination of generation and conservation options could be reduced to the level of impacts associated with the renewal of the OLS for Quad Cities Units 1 and 2.

## 8.4 References

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10 CFR Part 50. Code of Federal Regulations, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Functions."

10 CFR Part 52. Code of Federal Regulations, Title 10, *Energy*, Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants."

40 CFR Part 50. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 50, "National Primary and Secondary Ambient Air Quality Standards."

40 CFR Part 51. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 51, "Requirements for Preparation, Adoption, and Submittal of Implementation Plans."

40 CFR Part 60. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 60, "Standards of Performance for New Stationary Sources."

40 CFR Part 81. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes."

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## 9.0 Summary and Conclusions

By letter dated January 3, 2003, the Exelon Generation Company, LLC (Exelon) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses (OLs) for the Quad Cities Units 1 and 2 nuclear power plants for an additional 20-year period (Exelon 2003a). If the OLs are renewed, State regulatory agencies and Exelon will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the operating licenses are renewed, the renewed licenses would supersede the current licenses. The renewed licenses would expire on December 14, 2032, which is 20 years after the original license expiration date. If the OLs are not renewed, the plant must be shut down at or before the expiration of the current OLs, both of which expire on December 14, 2012.

Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 Code of Federal Regulations (CFR Part 51), which identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires the preparation of an EIS or a supplement to an EIS for the renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).<sup>(a)</sup>

Upon acceptance of the Exelon application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an EIS and conduct scoping in the *Federal Register* (68 FR 12385 [NRC 2003a]) on March 14, 2003. The staff visited the Quad Cities site in March 2003 and held public scoping meetings on April 8, 2003, in Moline, Illinois (NRC 2003b). The staff reviewed the Exelon Environmental Report (ER; Exelon 2003b), compared it to the GEIS, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000). The staff also considered the public comments received during the scoping process for preparation of this supplemental environmental impact statement (SEIS) for Quad Cities Units 1 and 2. The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part 1, of this SEIS.

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(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

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The staff held two public meetings in Moline, Illinois, in December 2003 to describe the preliminary results of the NRC environmental review and to answer questions to provide members of the public with information to assist them in formulating their comments. All the comments received on the SEIS were considered by the staff in developing this final SEIS and are presented in Appendix A, Part II.

The NRC has adopted the following statement of purpose and need for license renewal from the GEIS:

The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than the NRC) decisionmakers.

The evaluation criterion for the staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine

... whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

NRC regulations [10 CFR 51.95(c)(2)] contain the following statement regarding the content of SEISs prepared at the license renewal stage:

The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of

reactor operation — generic determination of no significant environmental impact”] and in accordance with § 51.23(b).<sup>(a)</sup>

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. In the GEIS, the NRC evaluated 92 environmental issues using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines. The following definitions of the three significance levels are set forth in a footnote to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

**SMALL** – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

**MODERATE** – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

**LARGE** – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS shows the following:

- (1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.
- (2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).
- (3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

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(a) The title of 10 CFR 51.23 is “Temporary storage of spent fuel after cessation of reactor operations – generic determination of no significant environmental impact.”

## Summary and Conclusions

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must also be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This SEIS documents the staff's consideration of all 92 environmental issues considered in the GEIS. The staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the OLS for Quad Cities Units 1 and 2) and alternative methods of power generation. These alternatives are evaluated assuming that the replacement power-generation plant is located at the Quad Cities site or some other unspecified location.

## 9.1 Environmental Impacts of the Proposed Action — License Renewal

Exelon and the NRC staff have established independent processes for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. Neither Exelon nor the staff has identified information that is both new and significant related to Category 1 issues that would call into question the conclusions in the GEIS.

Similarly, neither public comments, Exelon, nor the staff has identified any new issue applicable to Quad Cities Units 1 and 2 that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all Category 1 issues that are applicable to Quad Cities Units 1 and 2.

Exelon's license renewal application presents an analysis of the Category 2 issues that are applicable to Quad Cities Units 1 and 2 plus environmental justice. The staff has reviewed the Exelon analysis for each issue and has conducted an independent review of each issue. Four Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at Quad Cities. Four Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. Exelon has indicated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of Quad Cities Units 1 and 2 for the license renewal period (Exelon 2003b). In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to the Operation of Quad Cities Units 1 and 2* (AEC 1972).

Thirteen Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. For 12 Category 2 issues and environmental justice, the staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For threatened or endangered species, the staff's conclusion is that the impact of resulting license renewal would be SMALL and further mitigation is not warranted. For severe accident mitigation alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for Quad Cities Units 1 and 2, and the plant improvements already made, the staff concludes that four of the candidate SAMAs are cost-beneficial and two other SAMAs are potentially cost-beneficial. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they do not need to be implemented as part of license renewal pursuant to 10 CFR Part 54.

For one issue, the staff's conclusion is that the potential environmental impact of renewal term operations of Quad Cities Units 1 and 2 is greater than SMALL. The staff concludes that the impact of the potential for induced electric shock from transmission lines along transmission line corridors is MODERATE for the portions of the north Nelson line where calculated induced currents exceed the National Electric Safety Code specification of 5 mA. For a portion of the north Nelson line, the calculated induced electric shock was 6 mA. The NRC staff has informed the transmission line owner of this finding.

Mitigation measures were considered for each category 2 issue. Current measures to mitigate the environmental impacts of plant operation were found to be adequate for 11 issues, and no additional mitigation measures were deemed sufficiently beneficial in these issue areas to be warranted. However, for the issue of electric shock potential, consideration of further mitigation is recommended.

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

### 9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have

## Summary and Conclusions

already occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

The adverse impacts identified for 12 of the 13 Category 2 issues relevant to continued operation are considered to be of SMALL significance, and none warrant the implementation of additional mitigation measures. The potential adverse impact of electric shock for the north Nelson line is considered MODERATE. As noted above, consideration of mitigation measures for this issue may be warranted. The adverse impacts of likely alternatives if Quad Cities Units 1 and 2 cease operation at or before the expiration of the current OLs will not be smaller than those associated with continued operation of these units, and they may be greater for some impact categories in some locations.

### 9.1.2 Irreversible or Irretrievable Resource Commitments

The commitment of resources related to construction and operation of Quad Cities Units 1 and 2 during the current license periods was made when the plant was built. The resource commitments to be considered in this SEIS are associated with the continued operation of the plant for an additional 20 years. These resources include materials and equipment required for plant maintenance and operation, the nuclear fuel used by the reactors, and ultimately, permanent offsite storage space for the spent fuel assemblies.

The most significant resource commitments related to operation during the renewal term are the fuel and the permanent storage space. Quad Cities Units 1 and 2 replace approximately one-third of the fuel assemblies in each of the two units during every refueling outage, which occurs on a 24-month cycle.

The likely power-generation alternatives if Quad Cities Units 1 and 2 cease operation on or before the expiration of the current OLs will require a commitment of resources for constructing the replacement plants as well as for fuel to run the plants.

### 9.1.3 Short-Term Use Versus Long-Term Productivity

An initial balance between short-term use and long-term productivity of the environment at the Quad Cities site was set when the plant was approved and construction began. That balance is now well established. Renewing the OLs for Quad Cities Units 1 and 2 and the continued operation of the plant will not alter the existing balance, but renewing the OL may postpone the availability of the site for other uses. Denial of the application to renew the OLs will lead to the shutdown of the plant and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the Quad Cities site into a park or an industrial facility are quite different.



## 9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives

The proposed action is renewal of the OLs for Quad Cities Units 1 and 2. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at Quad Cities Units 1 and 2. Chapters 4 through 7 discuss environmental issues associated with renewing the OLs. Environmental issues associated with the no-action alternative and alternatives involving power generation and use reduction are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewing the OLs); the no-action alternative (denial of the application); alternatives involving nuclear, or coal- or gas-fired generation of power at the Quad Cities site or an unspecified alternate site; and a combination of alternatives are compared in Table 9-1. Use of a closed-cycle cooling system with cooling towers for alternate power generation is assumed for Table 9-1. Once-through cooling impacts will be smaller in some instances (e.g., land use) and larger in others (e.g., aquatic ecology).

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for nine impact categories (except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a single significance level was not assigned [See Chapter 6]). The significance of the potential for shock is considered MODERATE for that portion of the north Nelson line where the induced shock is greater than 5 mA. The alternative actions, including the no-action alternative, may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

## 9.3 Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the GEIS (NRC 1996; 1999); (2) the ER submitted by Exelon (Exelon 2003b); (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of the public comments, the recommendation of the staff is that the Commission determine that the adverse environmental impacts of license renewal for Quad Cities Units 1 and 2 are not so great that preserving the option of license renewal for energy-planning decisionmakers would be unreasonable.

**Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and Alternative Methods of Generation<sup>(a)</sup>**

Impact Category	Proposed Action—License Renewal	No Action Alternative—Denial of Renewal	Coal-Fired Generation		Natural-Gas-Fired Generation		New Nuclear Generation		Combination of Alternatives	
			Quad Cities Site	Alternate Site <sup>(b)</sup>	Quad Cities Site	Alternate Site <sup>(b)</sup>	Quad Cities Site	Alternate Site <sup>(b)</sup>	Quad Cities Site	Alternate Site <sup>(b)</sup>
Land Use	SMALL	SMALL	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Ecology	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Surface-Water Use and Quality	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Groundwater Use and Quality	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE	SMALL	SMALL	MODERATE	MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health <sup>(c)</sup>	SMALL to MODERATE	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE
Aesthetics	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE
Historic and Archaeological Resources	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Environmental Justice	SMALL	SMALL	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE	SMALL	SMALL to LARGE

(a) Alternatives located at the Quad Cities site are assumed to utilize the existing once-through cooling system; alternatives located at an alternate site are assumed to use a closed-cycle cooling system with cooling towers.  
 (b) An alternate site is assumed, for the purpose of bounding potential impacts, to be an undeveloped site with no previous construction.  
 (c) Except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent-fuel disposal, for which a significance level was not assigned. See Chapter 6 for details.

## 9.4 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

Exelon Generation Company, LLC (Exelon). 2003a. *Application for Renewed Operating Licenses, Quad Cities Units 1 and 2*. Warrenville, Illinois.

Exelon Generation Company, LLC (Exelon). 2003b. *Applicant's Environmental Report — Operating License Renewal Stage Quad Cities Units 1 and 2*. Docket Nos. 50-254 and 50-265. Warrenville, Illinois.

National Environmental Policy Act of 1969, as amended (NEPA). 42 USC 4321, et seq.

U.S. Atomic Energy Commission (AEC). 1972. *Final Environmental Statement Related to the Operation of Quad-Cities Nuclear Power Station, Units 1 and 2, Commonwealth Edison Company and the Iowa-Illinois Gas and Electric Company*. Docket Nos. 50-254 and 50-265. Directorate of Licensing, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*, "Section 6.3—Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2003a. "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." *Federal Register*. Vol. 68, No. 50, pp. 12385–123386. March 14, 2003.

U.S. Nuclear Regulatory Commission (NRC). 2003b. *Environmental Impact Statement Scoping Process: Summary Report—Quad Cities Units 1 and 2*. Moline, Illinois. Washington, D.C.

## **Appendix A**

### **Comments Received on the Environmental Review**

## Appendix A

### Comments Received on the Environmental Review

#### Part I – Comments Received During Scoping

On March 14, 2003, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the *Federal Register* (68 FR 12385) to notify the public of the staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, to support the renewal application for the Quad Cities Units 1 and 2 operating licenses and to conduct scoping. This plant-specific supplement to the GEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) guidelines, and 10 CFR Part 51. As outlined by NEPA, the NRC initiated the scoping process with the issuance of the *Federal Register* Notice. The NRC invited the applicant; Federal, State, and local government agencies; local organizations; and individuals to participate in the scoping process by providing oral comments at scheduled public meetings and/or submitting written suggestions and comments no later than May 12, 2003.

The scoping process included two public scoping meetings, which were held at The Mark of the Quad Cities in Moline, Illinois, on April 8, 2003. To publicize the meetings, the NRC staff issued a press release and posted flyers in nearby areas commonly visited by local residents. Approximately 120 members of the public attended the meetings. Both sessions began with NRC staff members providing brief overviews of the license renewal process and the NEPA process. After the NRC's prepared statements, the meetings were opened for public comments. Thirteen attendees provided either oral or written statements that were recorded and transcribed by a certified court reporter. The meeting transcripts are an attachment to the *Summary of Public Scoping Meetings to Support Review of the Quad Cities Nuclear Power Station, Units 1 and 2 License Renewal Application*, dated June 16, 2003. The Public Electronic Reading Room (ADAMS) accession number for the document package containing the summary report, the transcripts and presentation slides is ML0321631260. (This accession number is provided to facilitate access to the document through the Agencywide Documents Access and Management System [ADAMS] at <http://www.nrc.gov/reading-rm.html>.) In addition to the comments provided during the public meetings, four e-mail messages were received by the NRC in response to the Notice of Intent published in the *Federal Register*.

The scoping process provides an opportunity for public participation to identify issues to be addressed in the plant-specific supplement to the GEIS and highlight public concerns and issues. The Notice of Intent to prepare an environmental impact statement (EIS) identified the following objectives of the scoping process:

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- Define the proposed action
- Determine the scope of the supplement to the GEIS and identify significant issues to be analyzed in depth
- Identify and eliminate peripheral issues
- Identify any environmental assessments and other environmental impact statements being prepared that are related to the supplement to the GEIS
- Identify other environmental review and consultation requirements
- Indicate the schedule for preparation of the supplement to the GEIS
- Identify any cooperating agencies
- Describe how the supplement to the GEIS will be prepared.

At the conclusion of the scoping period, the NRC staff and its contractors reviewed the transcripts and all written material received to identify specific comments and issues. All comments and suggestions received orally or in writing during the scoping meetings were considered. Each set of comments from an individual was given a unique identifier (Commenter ID) so that the comments could be traced back to the original transcript, letter, or e-mail containing the comment. Several commenters submitted more than one set of comments (e.g., they made statements in both the afternoon and evening scoping meetings). In these cases, there is a unique Commenter ID for each set of comments.

Table A-1 identifies the individuals who provided comments applicable to the environmental review and gives the Commenter ID associated with each set of comments. Individuals who spoke at the scoping meetings are listed in the order in which they spoke at the public meeting, and in alphabetical order for the comments received by letter or e-mail.

Specific comments were categorized and consolidated by topic. Comments with similar specific objectives were combined to capture the common essential issues raised by the commenters. The comments fall into one of several general groups. These groups include:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related Federal actions.

- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the Quad Cities license renewal application.
- Questions that do not reveal new information.
- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations. These comments typically address issues such as the need for power, emergency preparedness, current operational safety issues, and safety issues related to operation during the renewal period.

Each comment received during the scoping process is summarized in the *Environmental Scoping Summary Report Associated with the Staff's Review of the Application by Exelon Generation Company for Renewal of the Operating Licenses for the Quad Cities Nuclear Power Station, Units 1 and 2*, dated July 21, 2003. The ADAMS accession number for this document is ML032030456.

Each comment applicable to this environmental review is summarized here in Part 1 of Appendix A. This information, which was extracted from the July 21, 2003, scoping summary report, is provided for the convenience of those interested in the scoping comments applicable to this environmental review. The comments that are general in nature or outside the scope of the environmental review for the proposed Quad Cities Units 1 and 2 license renewal are not included here. More detail regarding the disposition of general or inapplicable comments can be found in the summary report. The following pages summarize the contents and suggestions received as part of the scoping process that are applicable to this environmental review and discuss the disposition of the comments and suggestions. The parenthetical identifier after each comment refers to the comment set (Commenter ID) and the comment number.

Comments in this section are grouped in the following categories:

- A.1.1 Comments Concerning Category 2 Aquatic Ecology Issues
- A.1.2 Comments Concerning Category 2 Terrestrial Resource Issues
- A.1.3 Comments Concerning Category 2 Socioeconomic Issues
- A.1.4 Comments Concerning Alternatives

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**Table A-1. Individuals Providing Comments During the Scoping Comment Period**

<b>Commenter ID</b>	<b>Commenter</b>	<b>Affiliation (If Stated)</b>	<b>Comment Source and ADAMS Accession Number<sup>(a)</sup></b>
QCS-A	Jim Bohnsack	Rock Island County Board	Afternoon Scoping Mtg.
QCS-B	Leo Geerts	Albany Fire Protection District	Afternoon Scoping Mtg.
QCS-C	Tim Tulon	Quad Cities Nuclear Power Station	Afternoon Scoping Mtg.
QCS-D	Fred Polaski	Exelon	Afternoon Scoping Mtg.
QCS-E	Rob Lamb	Quad Cities Development Group	Afternoon Scoping Mtg.
QCS-F	Stuart Whitt	Whitt Law	Afternoon Scoping Mtg.
QCS-G	Chris Filbert	Cordova Township Road Commission	Afternoon Scoping Mtg.
QCS-H	Larry Toppert	Toppert Jetting Service	Afternoon Scoping Mtg.
QCS-I	Don Swensson		Afternoon Scoping Mtg.
QCS-J	Patrick O'Conner	Newberg-Perinni/Stone and Webster	Afternoon Scoping Mtg.
QCS-K	John Malvik	Rock Island County Board	Afternoon Scoping Mtg.
QCS-L	Tim Tulon	Quad Cities Nuclear Power Station	Evening Scoping Mtg.
QCS-M	Fred Polaski	Exelon	Evening Scoping Mtg.
QCS-N	Sue Hebel	Cordova District Library	Evening Scoping Mtg.
QCS-O	Leslie Perrigo		Evening Scoping Mtg.
QCS-P	David Olson		Email (ML031400167)
QCS-Q	Joyce/Jack Wiley		Email (ML031400174)
QCS-R	M. J. Regan		Email ML031400177)
QCS-S	Scott Gardner	Cordova Dragway Park	Email (ML031700164)

(a) The afternoon transcripts can be found under accession number ML031640068 and the evening transcripts can be found under accession number ML031640085.



## **A.1 Comments and Responses**

### **A.1.1. Comments Concerning Category 2 Aquatic-Ecology Issues**

As stated in 10 CFR Part 51, Table B-1, Category 2 aquatic ecology issues include the following:

- Entrainment of fish and shellfish in early life stages
- Impingement of fish and shellfish
- Heat shock.

**Comment:** I think many people probably do not realize that we are the only private sector facility to operate a fish hatchery on the Mississippi River. And ever since 1984 we have put four million fish right here locally in Mississippi Pools 13 and 14. (QCS-C-9)

**Comment:** Also the station supports this fish hatchery and stocks the river with walleye and striped bass. (QCS-N-3)

**Comment:** Now because of the elevated temperature of the river which is directly related to the nuclear plant dumping radioactive warmer water back into the Mississippi, it no longer freezes completely. This has directly resulted in loss of larger clams which no longer can be found in the area. (QCS-R-3)

**Response:** *The comments are noted. The comments relate to aquatic ecology issues and are discussed in Chapters 2 and 4 of this draft SEIS.*

### **A.1.2. Comments Concerning Category 2 Terrestrial Resource Issues**

As stated in 10 CFR Part 51, Table B-1, Category 2 terrestrial resource issues include the following:

- Refurbishment impacts to terrestrial resources
- Threatened or endangered species.

**Comment:** The plant keeps the river open in the winter time. Because of this, there are many more eagles and water fowl in the area. (QCS-N-2)

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**Response:** *The comment is noted. The comment relates to terrestrial resource issues and are discussed in Chapter 4 of this draft SEIS.*

### **A.1.3. Comments Concerning Category 2 Socioeconomic Issues**

As stated in 10 CFR Part 51, Table B-1, Category 2 socioeconomic issues include the following:

- Housing
- Public services: public utilities
- Public services: education (refurbishment)
- Offsite land use (refurbishment)
- Offsite land use (license renewal term)
- Public services: transportation
- Historic and archaeological resources.

**Comment:** And of course we could not go without saying that it does provide an economic stability in this area. (QCS-B-3)

**Comment:** So it is an economic source that we don't want to lose. (QCS-B-5)

**Comment:** So our payroll is 57 million dollars, 57 million dollars worth of payroll which directly helps the local community. (QCS-C-4)

**Comment:** Right here in the Quad Cities to obtain that labor and so last year that resulted in 30 million dollars, a 30-million dollar payroll to these local craftsmen. (QCS-C-5)

**Comment:** So I would offer to you that, number one, is we are a very significant source of employment for the local area and number two, we are a positive economic force. (QCS-C-6)

**Comment:** And regardless of any extreme positions that were taken in the appeal process at PECO and Chairman Bohnsack, I want to just tell you flat out is that we intend to pay property taxes. We intend to be a good neighbor. (QCS-C-7)

**Comment:** Also, I want to mention that our employees are generous and involved in many local activities. (QCS-C-8)

**Comment:** The second is in terms of jobs. The station employs about 700 local citizens and provides good income to many area families. The annual payroll from the station puts about 50 million dollars into the greater Quad Cities community. (QCS-E-3)

**Comment:** Finally, the station pays about three and a half million dollars in taxes annually. These taxes support our schools and our community infrastructure, making the greater Quad Cities more attractive to companies looking to expand in this area and making the Quad Cities a better place for our residents and corporate citizens as well. (QCS-E-4)

**Comment:** Since that time the Quad Cities Nuclear Power Station has had a significant, positive impact upon the area's economic vitality. The county, the college, and the school district all recognize and appreciate the positive benefits the station has brought to the area. (QCS-F-1)

**Comment:** They have provided quality jobs to many residents of Cordova Township and funds to the area school district. (QCS-G-3)

**Comment:** The biggest boost to the road and bridge district is the tax share supported by Exelon. Without that tax base our district would be in serious and desperate trouble. Approximately 70 percent of the monies collected in taxes are Exelon's share. This tax base helps keep our roads in tip top condition. (QCS-G-5)

**Comment:** Last year our firm worked more than 750,000 person-hours at the Quad Cities Station. That's the equivalent of 375 full-time employees working at the site throughout the year. Our employees earned more than \$30 million, much of which was returned to the local economy. (QCS-J-2)

**Comment:** That investment has resulted in additional jobs for our employees in the short term and will mean plenty of work in the future for refueling outages and to maintain that equipment to a high state of readiness and availability. (QCS-J-6)

**Comment:** I'm also in charge of Academic Achievement Award Program for Riverdale High School, which is supported by the Quad Cities Chamber of Commerce, and the plant has been very generous with this scholarship program. (QCS-N-4)

**Comment:** Aside from the tax issue, the Quad Cities Nuclear Power Station has been a good neighbor financially to the Cordova Library as well. (QCS-N-5)

**Response:** *The comments are noted. Socioeconomic issues specific to the plant are Category 2 issues and are addressed in Chapter 4 of this draft SEIS.*

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**Comment:** Our concern is that they pay their fair taxes and I know this is talking about environmental but also had calls from different public and private sectors in the last week saying Exelon or MidAmerica has called them asking them as a public relations and I think that's, that's not the fair gimmick or the thing that you want to hear today. (QCS-A-1)

**Comment:** In their tax appeal, they pretty much show that they want nothing, it's over \$700 million and they're saying they don't want to pay any, any property taxes. We think that's terrible. We are trying to negotiate with them now to have some kind of equitable property tax. (QCS-A-2)

**Comment:** And so I want to make sure you understand that they're worthy of, of running a good facility, but they also need to be paying their fair share. (QCS-A-3)

**Comment:** However, reduction of the station's taxable value as requested by the owners will have a devastating impact upon the local taxing districts responsible for those social services which are vital to the community. The county will lose over \$400,000 and the college will lose over a quarter of a million, resulting in substantial layoffs and the corresponding reduction of social services. The school district will lose more than \$2 million or nearly 29 percent of its entire budgeted revenue. (QCS-F-2)

**Comment:** With this loss, it will be impossible for the district to maintain a quality educational program for its students. (QCS-F-3)

**Comment:** The county, the college, and the school district all request that the Nuclear Regulatory Commission solicit and accept statements from the local taxing bodies for inclusion in the supplemental environmental impact statement and further ask that Edison drop its appeal. (QCS-F-4)

**Comment:** Exelon doesn't want to pay for its fair share of taxes. That's the bottom line. They don't want to pay as much in taxes as they are paying. (QCS-K-1)

**Comment:** This giant and profitable corporation wants to shift its civic duty to pay taxes to the little guy, the working men and women of our community, our senior citizens, those who have to struggle to make ends meet. (QCS-K-2)

**Comment:** I realize that Cordova is a major employer for our area, but I would also like to point out that under deregulation, many jobs have already been cut. (QCS-O-9)

**Response:** *The comments are noted. Socioeconomic issues specific to the plant are Category 2 issues and are addressed in Chapter 4 of this draft SEIS.*

### A.1.4 Comments Concerning Alternatives

**Comment:** During the preparation of the license extension paperwork, a comparison was done to say, okay, if you take the generation of Quad Cities and you don't use the nuclear option and you use a coal-burning type of option, what would that result in? The result would be 6000 tons of sulphur dioxide emission to the environment. Seventeen hundred tons of both nitric oxides and also carbon monoxides. So it's a very significant benefit, I think, that nuclear has is the avoidance of this greenhouse issue. (QCS-C-11)

**Comment:** And we looked at other ways of generating nuclear power and determined that any alternate means of generating electricity that 1800 megawatts would have more of an impact on the environment than if we continued to operate Quad Cities for an additional 20 years. (QCS-D-2)

**Comment:** Although the nuclear industry does produce far less, or does emit far less carbon than conventional plants, such as coal, carbon dioxide is still emitted at every step of the nuclear fuel chain from uranium mining to the decommissioning of old reactors. (QCS-O-7)

**Comment:** So it is possible to function in the Quad Cities without nuclear power plants, and we do have amazing potential for renewable energy. (QCS-O-10)

**Comment:** Every year the sun emits two thousand times more energy than the world consumption needs. When resources in the West and Midwest have more potential energy than the oil fields of Saudi Arabia and together electricity and hydrogen can meet all the energy needs of a modern society. (QCS-O-11)

**Comment:** This is a very exciting time in technology, so we would just like the NRC to consider other options and just acknowledge that there are other options out there and taking it into consideration all the safety concerns regarding nuclear power. (QCS-O-12)

**Comment:** There are other sources of energy that are renewable and environmentally safe, such as wind and solar that would also create good, high-paying jobs. (QCS-P-5)

**Response:** *The comments are noted. Impacts from reasonable alternatives for the Quad Cities license renewal will be evaluated in Section 8 of the SEIS.*

## Part II - Comments Received on the Draft SEIS

Pursuant to 10 CFR Part 51, the staff transmitted the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Quad Cities Nuclear Power Station, Units 1*

## Appendix A

*and 2, Draft Report for Comment* (NUREG-1437, Supplement 16, referred to as the draft SEIS) to Federal, State, Native American Tribal, and local government agencies as well as interested members of the public. As part of the process to solicit public comments on the draft SEIS, the staff:

- placed a copy of the draft SEIS in the NRC's electronic Public Document Room; its license renewal website; at the Cordova District Library, Cordova, Illinois; the River Valley Library, Port Byron, Illinois; and the Davenport Public Library, Davenport, Iowa
- sent copies of the draft SEIS to the applicant, members of the public who requested copies, and certain Federal, state, Native American Tribal, and local agencies
- published a notice of availability of the draft SEIS in the *Federal Register* on November 13, 2003 (68 FR 64372)
- issued public announcements, such as advertisements in the local newspapers and posting in public places, of the availability of the draft SEIS
- announced and held two public meetings in Moline, Illinois, on December 16, 2003, to describe the results of the environmental review and answer related questions
- issued public service announcements and press releases announcing the issuance of the draft SEIS, the public meeting, and instructions on how to comment on the draft SEIS
- established a website to receive comments on the draft SEIS through the Internet.

During the comment period, the staff received a total of 12 comment letters in addition to comments received during the public meetings.

The staff has reviewed the public meeting transcripts and the comment letters that are part of the docket file for the application, all of which are available in the NRC's electronic Public Document Room. Appendix A, Part II, Section A.2, contains a summary of the comments and the staff's responses. Related issues are grouped together. Appendix A, Part II, Section A.3, contains copies of the public meeting transcripts and the comment letters.

Each comment identified by the staff was assigned a specific alphanumeric identifier (marker). That identifier is typed in the margin of the letter at the beginning of the discussion of the page where the comment can be found, and the section(s) of this report in which the comment is addressed is provided in Table A-2. The 12 written comment letters are identified by the identifiers QC04 through QC16. The accession number is provided for the written comments after the letter date to facilitate access to the document through the Public Electronic Reading Room (ADAMS) <<http://www.nrc.gov/reading-rm/adams/login.html>>.

The staff made a determination on each comment that it was one of the following:

- (1) A comment that was either related to support of, or opposition to license renewal in general (or specifically the Quad Cities Nuclear Power Station) or made a general statement about the license renewal process. It may have made only a general statement regarding Category 1 and/or Category 2 Issues. In addition, it provided no new information and does not relate to safety considerations reviewed under 10 CFR Part 54.
- (2) A comment regarding environmental issues pertaining to 10 CFR Part 51.
- (3) A comment that raised an environmental issue that was not addressed in the GEIS or the Draft SEIS.
- (4) A comment regarding severe accident mitigation alternative analysis.
- (5) A comment outside the scope of license renewal (not related to 10 CFR Parts 51 or 54).

Comments without a supporting technical basis or without any new information are discussed in this appendix, and not in other sections of this report. Relevant references that address the issues within the regulatory authority of the NRC are provided where appropriate. Many of these references can be obtained from the NRC Electronic Public Document Room.

Within each section of Part II of this appendix (A.2.1 through A.2.14), similar comments are grouped together for ease of reference, and a summary description of the comments is given followed by the staff's response. Where the comment or the question resulted in a change in the text of the SEIS, Table A-2 refers the reader to the appropriate section of this report where the change was made. Revisions to the text in this SEIS are designated by vertical lines in the margin beside the text.

Table A-2. Comments Received on the Draft SEIS

Comment Number	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
QC01-1	J. Bohnsack	Afternoon meeting transcript (12/16/03) ML040360159	A-69	A.2.7
QC01-2	J. Bohnsack	Afternoon meeting transcript (12/16/03)	A-70	A.2.7
QC02-1	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-80	A.2.13
QC02-2	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-80	A.2.13
QC02-3	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-80	A.2.13
QC02-4	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-81	A.2.9
QC02-5	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-81	A.2.9
QC02-6	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-81	A.2.9
QC02-7	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-81	A.2.13
QC02-8	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-81	A.2.13
QC02-9	L. Perrigo	Afternoon meeting transcript (12/16/03)	A-81	A.2.3
QC03-1	B. Brown	Evening meeting transcript (12/16/03) ML040360183	A-110	A.2.13
QC03-2	B. Brown	Evening meeting transcript (12/16/03)	A-110	A.2.13
QC03-3	B. Brown	Evening meeting transcript (12/16/03)	A-111	A.2.13
QC03-4	B. Brown	Evening meeting transcript (12/16/03)	A-111	A.2.13
QC03-5	B. Brown	Evening meeting transcript (12/16/03)	A-112	A.2.13
QC03-6	B. Brown	Evening meeting transcript (12/16/03)	A-112	A.2.13
QC03-7	B. Brown	Evening meeting transcript (12/16/03)	A-112	A.2.13
QC03-8	B. Brown	Evening meeting transcript (12/16/03)	A-112	A.2.13
QC03-9	B. Brown	Evening meeting transcript (12/16/03)	A-112	A.2.13
QC03-10	B. Brown	Evening meeting transcript (12/16/03)	A-112	8.2.3, A.2.12
QC03-11	B. Brown	Evening meeting transcript (12/16/03)	A-113	8.2.5.2, 8.2.6, A.2.12
QC03-12	B. Brown	Evening meeting transcript (12/16/03)	A-114	8.2.5.2, 8.2.6, A.2.12
QC03-13	B. Brown	Evening meeting transcript (12/16/03)	A-115	A.2.13
QC03-14	B. Brown	Evening meeting transcript (12/16/03)	A-115	8.2.5.2, A.2.12



Table A-2. (contd)

Comment Number	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
QC03-15	B. Brown	Evening meeting transcript (12/16/03)	A-115	8.2.5.2, 8.2.6, A.2.12
QC03-16	B. Brown	Evening meeting transcript (12/16/03)	A-115	A.2.12
QC03-17	B. Brown	Evening meeting transcript (12/16/03)	A-116	A.2.12
QC03-18	B. Brown	Evening meeting transcript (12/16/03)	A-116	8.2.5.2, 8.2.6, A.2.12
QC04-1	D. Monahan	Dec. 16, 2003, Letter ML040090255	A-118	A.2.5
QC04-2	D. Monahan	Dec. 16, 2003, Letter	A-118	A.2.9
QC04-3	D. Monahan	Dec. 16, 2003, Letter	A-118	A.2.11
QC04-4	D. Monahan	Dec. 16, 2003, Letter	A-118	A.2.4
QC04-5	D. Monahan	Dec. 16, 2003, Letter	A-118	8.2.5.11, A.2.12
QC05-1	K. A. Nagel	Jan. 1, 2004, Letter ML040080780	A-119	A.2.3
QC05-2	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.8
QC05-3	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.9
QC05-4	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.12
QC05-5	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.13
QC05-6	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.13
QC05-7	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.13
QC05-8	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.9
QC05-9	K. A. Nagel	Jan. 1, 2004, Letter	A-119	A.2.3
QC06-1	D. P. Jeffery and E. M. Jeffery	Dec. 16, 2003, Letter ML040080776	A-120	A.2.13
QC06-2	D. P. Jeffery and E. M. Jeffery	Dec. 16, 2003, Letter	A-120	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC06-3	D. P. Jeffery and E. M. Jeffery	Dec. 16, 2003, Letter	A-120	A.2.3
QC07-1	M. Chezick	Jan. 16, 2004, Letter ML040230534	A-121	A.2.10
QC08-1	P. Simpson	Jan. 26, 2004, Letter ML040330857	A-125	A.2.14
QC08-2	P. Simpson	Jan. 26, 2004, Letter	A-125	2.1.5, A.2.14
QC08-3	P. Simpson	Jan. 26, 2004, Letter	A-125	A.2.14
QC08-4	P. Simpson	Jan. 26, 2004, Letter	A-125	A.2.14

Appendix A

**Table A-2. (contd)**

<b>Comment Number</b>	<b>Speaker or Author</b>	<b>Source</b>	<b>Page of Comment</b>	<b>Section(s) Where Addressed</b>
QC08-5	P. Simpson	Jan. 26, 2004, Letter	A-125	4.2.2, A.2.14
QC08-6	P. Simpson	Jan. 26, 2004, Letter	A-125	A.2.14
QC08-7	P. Simpson	Jan. 26, 2004, Letter	A-125	4.4.1, A.2.14
QC08-8	P. Simpson	Jan. 26, 2004, Letter	A-126	A.2.14
QC08-9	P. Simpson	Jan. 26, 2004, Letter	A-126	4.4.1, A.2.14
QC08-10	P. Simpson	Jan. 26, 2004, Letter	A-126	A.2.14
QC08-11	P. Simpson	Jan. 26, 2004, Letter	A-126	A.2.14
QC08-12	P. Simpson	Jan. 26, 2004, Letter	A-127	4.4.5, A.2.14
QC08-13	P. Simpson	Jan. 26, 2004, Letter	A-127	4.6.2, A.2.14
QC08-14	P. Simpson	Jan. 26, 2004, Letter	A-127	A.2.14
QC08-15	P. Simpson	Jan. 26, 2004, Letter	A-127	4.6.2, A.2.14
QC08-16	P. Simpson	Jan. 26, 2004, Letter	A-127	4.6.2, A.2.14
QC08-17	P. Simpson	Jan. 26, 2004, Letter	A-127	4.6.2, A.2.14
QC08-18	P. Simpson	Jan. 26, 2004, Letter	A-127	4.6.2, A.2.14
QC08-19	P. Simpson	Jan. 26, 2004, Letter	A-127	A.2.14
QC08-20	P. Simpson	Jan. 26, 2004, Letter	A-127	4.8.6.2, A.2.14
QC08-21	P. Simpson	Jan. 26, 2004, Letter	A-127	4.8.6.2, A.2.14
QC08-22	P. Simpson	Jan. 26, 2004, Letter	A-127	4.8.7, A.2.14
QC08-23	P. Simpson	Jan. 26, 2004, Letter	A-127	4.9, A.2.14
QC08-24	P. Simpson	Jan. 26, 2004, Letter	A-128	A.2.14
QC08-25	P. Simpson	Jan. 26, 2004, Letter	A-128	8.2.4, A.2.14
QC08-26	P. Simpson	Jan. 26, 2004, Letter	A-128	9.1, A.2.14
QC08-27	P. Simpson	Jan. 26, 2004, Letter	A-128	9.2, A.2.14
QC08-28	P. Simpson	Jan. 26, 2004, Letter	A-128	9.2, A.2.14
QC08-29	P. Simpson	Jan. 26, 2004, Letter	A-128	9.2, A.2.14
QC08-30	P. Simpson	Jan. 26, 2004, Letter	A-130	9.2, A.2.9
QC08-31	P. Simpson	Jan. 26, 2004, Letter	A-130	9.2, A.2.9
QC08-32	P. Simpson	Jan. 26, 2004, Letter	A-130	9.2, A.2.9
QC08-33	P. Simpson	Jan. 26, 2004, Letter	A-131	9.2, A.2.9
QC09-1	N. Howey	Undated Letter ML040330869	A-133	A.2.6
QC09-2	N. Howey	Undated Letter	A-133	A.2.6

Table A-2. (contd)

Comment Number	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
QC09-3	N. Howey	Undated Letter	A-133	A.2.6
QC09-4	N. Howey	Undated Letter	A-134	A.2.63
QC09-5	N. Howey	Undated Letter	A-134	A.2.6
QC09-6	N. Howey	Undated Letter	A-134	A.2.6
QC10-1	S. Fisk	Jan. 26, 2004, Letter ML040330862	A-136	A.2.13
QC10-2	S. Fisk	Jan. 26, 2004, Letter	A-136	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC10-3	S. Fisk	Jan. 26, 2004, Letter	A-136	A.2.13
QC10-4	S. Fisk	Jan. 26, 2004, Letter	A-137	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC10-5	S. Fisk	Jan. 26, 2004, Letter	A-137	8.2.5.11, A.2.13
QC10-6	S. Fisk	Jan. 26, 2004, Letter	A-137	8.2.5.11, A.2.13
QC10-7	S. Fisk	Jan. 26, 2004, Letter	A-138	8.2.5.11, A.2.12
QC10-8	S. Fisk	Jan. 26, 2004, Letter	A-138	8.2.5.11, A.2.12
QC10-9	S. Fisk	Jan. 26, 2004, Letter	A-138	A.2.2
QC10-10	S. Fisk	Jan. 26, 2004, Letter	A-139	8.2.5.2, 8.2.6, A.2.12
QC10-11	S. Fisk	Jan. 26, 2004, Letter	A-139	8.2.5.2, A.2.12
QC10-12	S. Fisk	Jan. 26, 2004, Letter	A-139	8.2.5.2, 8.2.6, A.2.12
QC10-13	S. Fisk	Jan. 26, 2004, Letter	A-139	A.2.13
QC10-14	S. Fisk	Jan. 26, 2004, Letter	A-139	8.2.5.2, A.2.12
QC10-15	S. Fisk	Jan. 26, 2004, Letter	A-139	A.2.12
QC10-16	S. Fisk	Jan. 26, 2004, Letter	A-140	A.2.12
QC10-17	S. Fisk	Jan. 26, 2004, Letter	A-140	8.2.5.2, A.2.12
QC10-18	S. Fisk	Jan. 26, 2004, Letter	A-140	A.2.12

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Table A-2. (contd)

Comment Number	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
QC10-19	S. Fisk	Jan. 26, 2004, Letter	A-140	A.2.12
QC10-20	S. Fisk	Jan. 26, 2004, Letter	A-140	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC10-21	S. Fisk	Jan. 26, 2004, Letter	A-140	A.2.13
QC11-1	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter ML040330882	A-143	8.2.5.2, 8.2.6, A.2.12
QC11-2	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-143	8.2.5.2, A.2.12
QC11-3	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-143	8.2.5.2, 8.2.6, A.2.12
QC11-4	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-144	A.2.13
QC11-5	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-144	A.2.13
QC11-6	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-144	A.2.13
QC11-7	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-144	A.2.13
QC11-8	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-145	8.2.5.2, A.2.12
QC11-9	C. Montgomery, T. J. Budler	Jan. 27, 2004, Letter	A-145	A.2.12
QC12-1	L. Perrigo	Jan. 27, 2004, Letter ML040330875	A-146	A.2.3
QC12-2	L. Perrigo	Jan. 27, 2004, Letter	A-146	A.2.3
QC12-3	L. Perrigo	Jan. 27, 2004, Letter	A-146	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC12-4	L. Perrigo	Jan. 27, 2004, Letter	A-147	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC12-5	L. Perrigo	Jan. 27, 2004, Letter	A-147	A.2.9
QC13-1	L. Perrigo	Feb. 3, 2004, Letter ML040420166	A-151	A.2.1.3
QC13-2	L. Perrigo	Feb. 3, 2004, Letter	A-152	A.2.13
QC13-3	L. Perrigo	Feb. 3, 2004, Letter	A-155	A.2.13

Table A-2. (contd)

Comment Number	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
QC13-4	L. Perrigo	Feb. 3, 2004, Letter	A-155	A.2.13
QC13-5	L. Perrigo	Feb. 3, 2004, Letter	A-156	8.2.5.11, A.2.12
QC13-6	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.13
QC13-7	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.9
QC13-8	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.8
QC13-9	L. Perrigo	Feb. 3, 2004, Letter	A-156	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC13-10	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.7
QC13-11	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.13
QC13-12	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.13
QC13-13	L. Perrigo	Feb. 3, 2004, Letter	A-156	A.2.13
QC13-14	L. Perrigo	Feb. 3, 2004, Letter	A-157	A.2.13
QC13-15	L. Perrigo	Feb. 3, 2004, Letter	A-157	A.2.4
QC13-16	L. Perrigo	Feb. 3, 2004, Letter	A-157	A.2.1
QC13-17	L. Perrigo	Feb. 3, 2004, Letter	A-157	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.12
QC13-18	L. Perrigo	Feb. 3, 2004, Letter	A-157	A.2.3
QC13-19	L. Perrigo	Feb. 3, 2004, Letter	A-157	8.2.5.2, 8.2.5.3, 8.2.5.11, 8.2.6, A.2.3
QC14-1	C. Perrigo	Feb. 3, 2004, Letter ML040420166	A-178	A.2.3
QC14-2	C. Perrigo	Feb. 3, 2004, Letter	A-178	A.2.19
QC15-1	R. Fischer	Feb. 3, 2004, Letter ML040420166	A-179	A.2.3
QC16-1	K. Westlake	Feb. 5, 2004, Letter ML040500711	A-182	A.2.8
QC16-2	K. Westlake	Feb. 5, 2004, Letter	A-182	A.2.13
QC16-3	K. Westlake	Feb. 5, 2004, Letter	A-182	A.2.6
QC16-4	K. Westlake	Feb. 5, 2004, Letter	A-183	A.2.9
QC16-5	K. Westlake	Feb. 5, 2004, Letter	A-183	A.2.8
QC16-6	K. Westlake	Feb. 5, 2004, Letter	A-183	A.2.8

**Table A-2. (contd)**

<b>Comment Number</b>	<b>Speaker or Author</b>	<b>Source</b>	<b>Page of Comment</b>	<b>Section(s) Where Addressed</b>
QC16-7	K. Westlake	Feb. 5, 2004, Letter	A-183	A.2.8
QC16-8	K. Westlake	Feb. 5, 2004, Letter	A-184	A.2.11
QC16-9	K. Westlake	Feb. 5, 2004, Letter	A-184	A.2.12
QC16-10	K. Westlake	Feb. 5, 2004, Letter	A-184	A.2.12

## **A.2 Comments and Responses**

Comments in this section are grouped into the following categories:

- A.2.1 General Comments in Opposition to Nuclear Power
- A.2.2 General Comments in Opposition to the License Renewal Process
- A.2.3 General Comments in Opposition to License Renewal at Quad Cities
- A.2.4 Comments Concerning Category 1 Air Quality Issues
- A.2.5 Comments Concerning Category 1 Terrestrial Resource
- A.2.6 Comments Concerning Category 1 Human Health Issues
- A.2.7 Comments Concerning Socioeconomic Issues
- A.2.8 Comments Concerning Category 1 Uranium Fuel Cycle and Waste Management
- A.2.9 Comments Concerning Category 1 Postulated Accident Issues
- A.2.10 Comments Concerning Threatened and Endangered Species Issues
- A.2.11 Comments Concerning Decommissioning Issues
- A.2.12 Comments Concerning Alternatives to License Renewal
- A.2.13 Comments Concerning Out-of-Scope Issues: Operational Safety, Aging Management, Cost of Power, and Need for Power
- A.2.14 Editorial Comments

### **A.2.1 General Comments In Opposition to Nuclear Power**

**Comment:** The overall inherent dangers of radiation far outweigh the benefits of nuclear power. (QC13-16)

**Response:** *The comment is noted. The comment is opposed to nuclear power and is general in nature. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

### **A.2.2 General Comments In Opposition to the License Renewal Process**

**Comment:** Exelon and its subsidiary Commonwealth Edison should consider investments in energy efficiency to meet Illinois' power needs. But even if they prefer not to do so, that does not obviate the NRC's legal obligation under NEPA to do so. The point made in the Draft Supplement is legally flawed – an otherwise reasonable alternative cannot be rejected under NEPA simply because an applicant may not want to or cannot carry it out. Cf. 42 C.F.R. [sic] 1502.14(c) (agency cannot reject an alternative simply because it is outside the agency's jurisdiction); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 814 (9<sup>th</sup> Cir. 1999) (same). Instead, the NRC has the legal authority to tell Exelon that there is a better, cheaper, and environmentally preferable alternative to license renewal. The fact that energy efficiency efforts are more likely to materialize as a result of State or Federal government initiatives (such as an energy efficiency investment fund or an energy-efficient building code) in no way provides a basis for rejecting the economically, technologically, and environmentally feasible alternative of energy efficiency. (QC10-9)

**Response:** *The comment is noted. The Supplemental EIS presents the staff's analysis of the environmental impacts associated with the proposed license renewal and with reasonable alternatives. Staff agrees with the commenter's statements that increases in efficiency are technically possible and could result in energy savings that could replace Quad Cities generation. Staff also agrees with the commenter's inference that the overall impacts associated with implementing energy conservation would likely be SMALL. However, as discussed in 8.2.5.11, Exelon would not pursue large-scale conservation programs unless these were mandated or an incentive were provided by a government agency because of their high relative cost. Therefore, staff disagrees with the commenter's statement that a large-scale increase in energy efficiency is an economically feasible alternative to license renewal because the possibility of Congressional or State passage of incentives for conservation measures is speculative. Without these incentives, the costs of conservation programs are so high relative to other generation options that it is not reasonable to assume conservation programs would be implemented.*

*The comment provides no additional information. There were no changes made in the supplement because of this comment.*

### **A.2.3 General Comments in Opposition to License Renewal at Quad Cities**

**Comment:** Under the circumstances, it would be prudent to retire the Quad Cities Nuclear Power Station in 2012 and seek out safer more financial viable solutions for the community. (QC02-9)

**Comment:** I am writing to express my dismay and horror at the thought of any extension to the use of the Cordova Nuclear power plant! I am a citizen with a family living in the shadows of this plant. Personally, I wish all nuclear plants had never been built! They are a constant threat to our environment, and in fact to our lives. (QC05-1)

**Comment:** Please do not endanger me and my family, and our environment by allowing the Cordova plant to continue operating beyond it's original useful life-span!!! This is truly a matter of life and death, do not let it be a matter of money in some corporate pockets! (QC05-9)

**Comment:** Don't keep this plant open for another twenty years. I speak for my whole family, and all my neighbors. They, like my husband and me are older and handicapped. We can't get to the meetings, etc., so I've chosen this method of contacting you with our plea to get rid of the nuclear generator plant in our midst. (QC06-3)

**Comment:** The plant at Cordova is one of twenty-one nuclear power plants along the Mississippi River watershed, and one of the oldest Boiling Water Reactors in the nation. The inherrent [sic] design flaws of this model pose a seroius [sic] threat to not only members of the Quad Cites, but all those down stream from us. (QC12-1)

**Comment:** We cannot afford to put the Quad Cities and our neighbors downstream at risk. (QC12-2)

**Comment:** The Quad Cities Nuclear Power Station has outlived its purpose. We, the people, demand responsible energy solutions. Options, which can increase efficiency, meet our needs, create new jobs, and stimulate the local economy. (QC13-17)

**Comment:** A license renewal for the QCNPS offers little more than higher utility bills, further environmental degradation and greater potential for a nuclear disaster. (QC13-18)

**Comment:** In regard to the relicensing of the Quad City Nuclear Power Station, please retire this plant as it served it time, give us the opportunity to develop alternative energy sources, which will not pollute air and waterways. (QC14-1)

**Comment:** The Quad Cities nuclear power station has outlived its purpose. Increasing energy efficiency would actually provide us with more power than the QCNPS currently generates. The



people of the Quad Cities deserve responsible energy solutions which can increase efficiency, meet our needs, create new jobs and stimulate the local economy. License renewal for the QCNPS offers little more than higher utility bills, further environmental degradation and greater potential for a nuclear disaster. (QC15-1)

*Response: The comments are noted. The comments oppose license renewal at Quad Cities Nuclear Power Station, Units 1 and 2, and are general in nature. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

#### **A.2.4 Comments Concerning Category 1 Air Quality Issues**

**Comment:** Although emissions from nuclear plants are significantly lower than emissions from fossil fuels, carbon is emitted at every step of the nuclear fuel chain. (QC13-15)

*Response: The staff recognizes that atmospheric emissions occur during the uranium fuel cycle, including carbon emissions. The 1996 GEIS on License Renewal includes Table S-3, which lists both hydrocarbon and carbon monoxide emissions from the uranium fuel cycle. The GEIS also states that in a comparison with a coal-fired power plant of the same size with an abatement system, a 1300-MW(e) nuclear power plant reduces annual emissions to the air of about 8.5 million tons of CO<sub>2</sub> even after taking into account the entire uranium fuel cycle. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

#### **A.2.5 Comments Concerning Category 1 Terrestrial Resources**

**Comment:** I have been concerned about it for a good number of years, particularly when flocks of birds were found dead near it. (QC04-1)

*Response: The NRC staff contacted the commenter to obtain additional information regarding the "flocks of dead birds found dead near it [the Quad Cities Nuclear Power Plant]." The commenter was unable to state when the dead birds were observed, other than to say it was many years ago along a road to the power plant. The NRC staff also contacted the local field office of the U.S. Fish and Wildlife Service to obtain any available information which could be used to assess the significance of the comment. The FWS had no information regarding dead birds being found in the vicinity of the power plant. Based on the lack of available information which could be used to assess the significance of the observation noted in the comment, the NRC staff plans no further action. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

## **A.2.6 Comments Concerning Category 1 Human Health Issues**

**Comment:** We understand that collective doses are related to the background radiation levels resulting from the source term from activated corrosion products in the reactor and related systems, and the number of outages at a plant each year. IEMA hopes that 800 and 1,700 person-rem/year level collective doses are not indicative of the doses to be expected during the renewal term. Part of our concern is that the QC plants are in the bottom quartile of nuclear plants in regard to source term. Therefore, we question the NRC conclusion that no mitigative measures are needed in the renewal term. Many of those accumulating these exposures are Illinois citizens.

Therefore, IEMA would like to see as a condition to PLEX application approval, a requirement for the licensee to proactively monitor and control the source term over the renewal period. Decontamination and preventive methods are available to keep source terms under control. (QC09-1)

**Comment:** The plant's UFSARs assume structurally sound steam dryers in their current licensing basis. The QC steam dryers have not remained structurally sound. In addition, the root cause analyses and corrective actions done as a result of the first failure did not prevent the second failure. (QC09-2)

**Comment:** Extended power upgrades are speculated to be the root cause of the dryer failures. That may or may not turn out to be the case. Regardless, we assume those increased power levels will extend into the renewal period. We noted from inspection reports that during the scoping inspections done at QC, the steam dryers were not considered reactor internal components for PLEX purposes, although the FSAR does list them as a reactor internal component. Additionally, they were excluded from age related degradation management programs prior to and during the renewal period. The reason given was because they were non-safety related, and failure is an operational concern, but not a safety concern. We are not so sure. (QC09-3)

**Comment:** The conclusions of operability evaluations concerning the steam dryer failures made some assumptions. Among them was that any dryer parts that broke off would stay in the area of the separator/dryer, or be carried down the main steam line, where they would not affect any safety-related functions. It was determined as a result of the second dryer failure, some dryer material did not remain in the dryer area, but did travel through a recirculation loop and into the reactor vessel as a loose part. We anticipate that further engineering safety evaluations will conclude that the loose part(s) will cause no harm in the vessel. Regardless, thus far, steam dryer structural integrity is a present issue and contains large uncertainties over a twenty-year renewal term. Therefore, IEMA recommends that the status of the steam dryers

at Quad Cities be re-evaluated as to their non-safety related status under PLEX, and be considered a reactor component subject to an aging management program. (QC09-4)

**Comment:** In conclusion, our observations are that recent steam dryer problems at QC have caused forced outages. Only time will tell if the root cause of the dryer failures is a result of an extended power upgrade program. Regardless, the program will extend into the renewal term. It is not clear what effect the upgraded power level program might have on future plant component failures, but the increased number of outages needed to deal with them so far has dramatically increased the collective occupational exposure at the station. This was not anticipated in assumptions that went into the GEIS. Therefore, IEMA would like to see the steam dryers re-classified as a reactor component subject to an age-related degradation program under PLEX, and the licensee be required to commit to a proactive source term management program through the renewal term. (QC09-5)

**Response:** *The comments discuss the steam dryer cracking issue at Quad Cities and the higher occupational exposures received repairing the steam dryers. Steam dryer cracking is an issue of degradation of components that is addressed in the safety review of the license renewal application and is outside the scope of the environmental review. However, the higher occupational radiation exposures were reviewed against the evaluation in the GEIS. Based on that evaluation, the staff concluded that the higher occupational radiation exposures do not constitute new and significant information that challenges the GEIS conclusion that occupational radiation exposure is a Category 1 issue.*

*The comments provide no additional information. There were no changes made in the supplement because of these comments.*

**Comment:** Under Section 4.1 Environmental Impacts of Operation, Cooling System, page 4-6: The generic no-impact language referenced in this section about sediments states that sediment contamination is not a problem at most plants, and no new or significant information has been identified for the Quad Cities site. Accumulation of contaminants in sediments is a cumulative impact. The absence of an impact over the past years of operation does not demonstrate that accumulations will not reach a level of concern over an additional 20 years of operation. Furthermore, copper discharge was an issue at one power plant and was satisfactorily mitigated, according to the GEIS. We recommend the final SEIS for the Quad Cities site describe the potential for accumulation of contaminants in sediments in light of 20 additional operating years and consider whether mitigation may be advisable. (QC16-3)

**Response:** *The accumulation of both radioactive and nonradioactive contaminants from plant operation in receiving water sediments was evaluated in the GEIS on License Renewal. Section 2.2.7 of this SEIS briefly describes the radiological environmental monitoring program (REMP) conducted by the licensee at the Quad Cities site since 1968. The program requires*

*sampling and analysis for surface waters, the aquatic environment (fish, invertebrates and shoreline sediment), the atmospheric environment (airborne radioiodine, gross beta and gamma), the terrestrial environment (vegetation), milk, and direct radiation. The sediment sampling program includes eight locations downstream of the Quad Cities site. The sampling results are summarized in an "Annual Radiological Environmental Operating Report." The results from sampling found in this report for 2002 were below detectable levels. These results were found to be consistent with those from previous years. Therefore, the staff believes that radiological contamination of river sediments will not be a problem during the renewal period.*

*The Commission found in the GEIS that the accumulation of nonradioactive heavy metal contaminants in receiving water sediments has been a problem at a few nuclear power plants in the past, but the problem has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of a more environmentally benign metal. Copper contamination of Mississippi River sediments is not an issue at Quad Cities because the facility's condenser tubes are, and have always been, stainless steel.*

*Prior to the periodic renewal of the facility's NPDES permit, the licensee samples Mississippi River sediments for heavy metals in the vicinity of the plant. The results of those studies are forwarded with the application for renewal of the NPDES permit to the permitting agency. The results of those studies have not revealed the accumulation of heavy metals in receiving water sediments attributable to plant operation. Furthermore, there is no reason to believe that future plant operations would result in the accumulation of nonradioactive heavy metal contaminants in river sediments.*

*The comment provides no additional information. There were no changes made in the supplement because of this comment.*

#### **A.2.7 Comments Concerning Socioeconomic Issues**

**Comment:** And one of the problems we're having with Exelon is, and it's the major company, that's refusing to pay any property taxes in the Quad City area and that comes to about four million dollars a year. And they protested their taxes last year. They also did it again this year. And if we were to lose that that's \$8 million that comes out of the coffers out of the county and somebody has to make that up. (QC01-1)

**Comment:** If they don't pay that and we look at endangered species, you're going to see some very big children that are going to be endangered in that area school system. They pay about \$2 million in that school system. And I believe it's very important that they pay their fair share of taxes. And I'm just sure that the farmer's not going to be able to pay that kind of money for their children. (QC01-2)

**Comment:** Furthermore, it is unacceptable to expect ratepayers and Illinois residents, through their taxes, to continue to support a decrepit power plant that does not benefit its investors due to the many inevitable repairs which accompany the extension of an operating license.

As it stands, Exelon has submitted an appeal for a reduction of the stations taxable value, which would have a devastating effect upon the local taxing districts, and deprive the county of over \$400,000. The college will lose over a quarter million, resulting in substantial layoffs and the corresponding reduction of social services. The school district will lose more than \$2 million – nearly 29 percent of its entire budgeted revenues. (QC13-10)

**Response:** *Public services, such as education, public safety, and social services that are supported by tax revenues from nuclear power plants, were evaluated in the GEIS and determined to be Category 1 issues. Declines in tax revenues associated with changes in the assessed value of the Quad Cities Nuclear Power Station are not linked to license renewal and may occur at any time during the life of the facility. Therefore, changes in the assessed value of Quad Cities Units 1 and 2 are outside the scope of the SEIS. However, staff notes that even though tax revenues may be reduced during the license renewal period when compared to historic levels, some level of tax revenue would still be generated by the Quad Cities plant. This is considered a beneficial impact of license renewal. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

#### **A.2.8 Comments Concerning Category 1 Uranium Fuel Cycle and Waste Management**

**Comment:** The waste aspect alone caused by nuclear plants is enough reason for me to object vehemently to them. (QC05-2)

**Comment:** Because there is no known way to dispose of radioactive waste – the byproduct of nuclear facilities, and the Yucca Mountain Repository is not a suitable choice due to flawed science and the potential exposure of millions of people who live, work and play within mere miles of the proposed transport route, it would be prudent to reduce the amount of waste BEING GENERATED until a viable solution is discovered. (QC13-8)

**Comment:** Although the license applicant's environmental report (ER) to the NRC need not discuss aspects of storage of spent fuel, as noted on page 1-5, citing 10 CFR 51.23 (b), we suggest the NRC's final supplemental environmental impact statement (SEIS) discuss impacts from dry storage casks, because it would be a change in operation for the new license period. The draft SEIS states that Exelon plans to build an independent spent fuel storage installation for storing spent fuel in dry storage casks for use in 2005 (section 2.1.4, page 2-9). The change in storage option is not addressed elsewhere in the document. We suggest the NRC's final SEIS address spent fuel storage in dry storage casks, at least as far as it may be

addressed in the License Renewal Generic EIS, and include discussion about potential environmental impacts. In particular, the final SEIS should describe any differences in environmental impacts associate with this change to storage. (QC16-1)

**Comment:** *Section 6.1, The Uranium Fuel Cycle, page 6-6. Under the bullet point for Off-site radiological impacts (spent fuel and high level waste disposal), no consideration appears to be given to the potential long term storage of the spent fuel and high level waste materials on site until such time as a permanent facility is finally licensed and begins to accept these materials for disposal. A reference to other sections or documents where this evaluation may have been included should be provided here; otherwise the issue needs to be considered and evaluated. (QC16-5)*

**Response:** *The Waste Confidence Rule, found in 10 CFR Part 51.23, states that "the Commission has made a generic determination that, if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite or offsite independent spent fuel storage installations. Further, the Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century, and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in such reactor and generated up to that time." Onsite spent fuel storage facilities, and the associated storage casks, are licensed by the NRC and must meet standards set forth in 10 CFR Part 72. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

**Comment:** *Section 6.1, The Uranium Fuel Cycle, page 6-8. Under the bullet point for On-Site Spent Fuel. A more thorough evaluation for the volume of spent fuel expected to be generated during the addition licensed time needs to be provided along with more specific information as to site specific circumstances that may impair or improve the risk values for potential exposures to this spent fuel. (QC16-6)*

**Response:** *The impact associated with the volume of spent fuel expected to be generated during the license renewal period was evaluated in the GEIS and determined to be a Category 1 issue. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** *Section 6.1, The Uranium Fuel Cycle, page 6-8. The draft SEIS should be clearer about environmental impacts of transporting spent fuel to a repository site. We realize it may be premature to assess this fully on a power plant-specific basis; however, transportation to the nuclear waste repository appears to be reasonably foreseeable. The SEIS refers to the License*

Renewal GEIS (where transportation was discussed in a supplement: NUREG-14137, Vol 1, Addendum 1, 1999). The GEIS supplement, in turn, refers to the Draft Environmental Impact Statement (DEIS) for the Yucca Mountain Repository, which had not been finished at the time. These generic documents appear to assess impacts only within the State of Nevada. We recommend the final SEIS include more specific information about transport from this site, or else include a reference to route-specific information, as they may be covered in the Yucca Mountain Repository DEIS. In addition, we suggest the final SEIS be clear about whether transportation includes the process of removing spent fuel from casks and pools and loading it into vehicles. We suggest these processes be part of the transportation section, if not handled elsewhere, and we suggest the final SEIS discuss their impacts. (QC16-7)

*Response: The radiological and nonradiological environmental impacts from the transportation of fuel and waste attributable to license renewal of a power reactor were evaluated in Section 6.3 of the GEIS and the Addendum and are considered Category 1 issues. The Addendum to the GEIS specifically addressed whether the environmental impacts of the transportation of spent nuclear fuel are consistent with the values of 10 CFR Part 51.52, Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor," as applicable to license renewal, given that it is likely that spent fuel will be shipped to a single destination, such as the proposed repository at Yucca Mountain in Nye County, Nevada. The values in Table S-4 were found to be bounding when accounting for spent fuel shipments to a single destination. A discussion of route-specific information is not provided for two reasons: first, the Yucca Mountain facility is not licensed or completed; and, second, there are physical security issues related to the transport of the spent fuel that preclude a detailed discussion of routes. The NRC staff licenses the dry cask system to allow for the safe transport of the casks, regardless of the route selected. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

## **A.2.9 Comments Concerning Category 1 Postulated Accident Issues**

**Comment:** The Quad Cities units are members of an aging fleet of Boiling Water Reactors (BWR), engineered long before terrorism was even a consideration. In addition to the physical and chemical processes, which accelerate aging degradation of the systems, structures and components – such as corrosion, embrittlement, fabrication defects, vibration, water hammer and wear – there is also the concern of structural vulnerability. None of the 103 nuclear power plants operating in the United States were designed to withstand suicide attacks from the air, such as we tragically experienced on September 11, 2001. (QC13-12)

**Comment:** Currently, nuclear waste, or spent fuel, is kept in high-density pools six to ten stories up in the reactor's secondary containment building. The pools share a common wall with an exterior wall of the building, and do not appear to have any structural reinforcement to

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prevent the likelihood of penetration by deliberate attack. Attack on a reactor could lead to rapid onset core melt with an open containment, accompanied by a raging fire. Due to high radiation fields across the site access to the site by personnel would be precluded. (QC13-13)

**Comment:** Lastly, the continued operation of any General Electric Mark 1 boiling water reactor relies upon a nuclear waste storage and cooling pond that is elevated six to ten stories up in the reactor's secondary containment building and does not appear to have any significant structure to reduce the likelihood of penetration by deliberate attack. (QC02-4)

**Comment:** The identified structural vulnerability of Mark 1 radiated fuel storage and cooling pond constitutes an unreviewed safety issue. (QC02-5)

**Comment:** Defense of nuclear facilities should be seen as a key component to Homeland Security. As such, spent fuel pools should be reequipped with low density racks and all other spent fuel should be hardened and dispersed throughout the site to make it a less attractive target. (QC02-6)

**Comment:** We are fighting terrorists without, but living with the potential for terror within. (QC04-2)

**Comment:** In addition, we now face the added threat of terrorists using a nuclear plant for their evil purposes! (QC05-3)

**Comment:** Also, this plant and most others were designed and built long before 9/11; and therefore they have inherent risks to terrorist attacks, which we never planned for. (QC05-8)

**Comment:** PS- The following text is a copy of my summation from the afternoon session at the Mark in December, which I had told members of the NRC I would get to them. I was told that these were more "security issues," yet the security of the plant and its aging components has direct bearing on the surrounding environment, and its neighbors downstream. Please encourage your counterparts to take these issues seriously in that they affect us in the Quad Cities, and the Mississippi River watershed immediately. Thanks. (QC12-5)

**Comment:** Since containment buildings were not designed to withstand attacks by aircraft, there is an inherent possibility that a terrorist attack on a spent fuel pool could contaminate the surrounding environment and do irreversible harm to the Mississippi River watershed. (QC13-7)

**Response:** *In a recent decision in another license renewal proceeding, the Commission discussed the terrorism and sabotage issues raised in the comments. See Duke Energy Corp. (McGuire Nuclear Station, Units 1 & 2, and Catawba Nuclear Station, Units 1 & 2), CLI-02-26,*



*56 NRC 358,365, slip op. At 6-7 (Dec. 18, 2002). In that decision, the Commission found that NEPA imposes no legal duty on the NRC to consider intentional malevolent acts on a case-by-case basis in conjunction with commercial power reactor license renewal applications. The Commission concluded that the "environmental" effect caused by third-party miscreants is simply too far removed from the natural or expected consequences of agency action to require a study under NEPA.*

*The Commission has also indicated that terrorism differs from matters ordinarily considered in an environmental impact statement (EIS). An EIS may discuss, for example, such matters as likely effects on local water, air quality, vegetation, wildlife, culture, and socioeconomic concerns. These effects are reasonably certain; an EIS can quantify them to a fair degree of precision. Terrorism, by contrast, comes in innumerable forms and at unexpected times and places. It is decidedly not predictable, and it is not a natural or inevitable byproduct of renewing the license. For these reasons, the Commission has stated that an EIS is not an appropriate format in which to address the challenges of terrorism.*

*Nevertheless, the Commission did indicate that its decision not to use NEPA as a vehicle for a terrorism review does not mean that it is ignoring the issue. Rather the Commission continues to closely examine the current security and protective framework and orders interim improvements at licensed nuclear facilities, including reactors, if needed.*

*The comments provide no additional information. There were no changes made in the supplement because of these comments.*

**Comment:** *Section 5.2.2, Estimate of Risk:* Page 5-5 states "The baseline core damage frequency (CDF) for Quad Cities is approximately  $2.2 \times 10^{-6}$  per year, base on internally-initiated events. Exelon did not include the contribution to CDF from external events in these estimates even though the risk from external events is significantly higher for Quad Cities than risk from internal events."

We recommend evaluating and presenting risk estimates from both internal and external events. In addition, given the draft SEIS statements referenced above, effects of external events should be included in the risk decision considerations, as necessary, to get an accurate portrayal of the risk of the licensing renewal. If the final SEIS does not incorporate external events into risk calculations or risk decisions, it should provide a rationale for using internally-initiated events only. (QC16-4)

**Response:** *Although Exelon did not include the contribution to Core Damage Frequency from external events, the NRC staff evaluated these risks and factored the contribution from external events into the decision regarding severe accident mitigation alternatives (SAMAs). A detailed discussion of the risks from fire, seismic, and other external events is provided in Section G.2.2 of the SEIS. As described in Section 5.2.5 and G.6.2, the NRC staff increased the risk*

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*reduction estimates for candidate SAMAs by a factor of 10 to specifically account for their additional benefits in external events. The contribution to risk from external events dominates the total risk reduction estimates for each SAMA, and was an important factor in the cost-benefit evaluation for each SAMA. The impact of external events on the risk reduction estimates, and the dispositioning of each candidate SAMA is described in Sections G.6.2 and G.7 of the SEIS. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** Both Exelon and NRC agree that significant conservatism exist in the current fire PRA. These conservatisms overstate the actual risk from fire at Quad Cities (QC DEIS, page G-24). The NRC staff reviewers, however, disagreed with a risk multiplier of 5 used by Exelon to account for uncertainties in external events analysis, mostly for fire. The NRC suggested a value of 10. It should be pointed out that the existing 1999 fire PRA study was performed not to provide detailed estimates for fire risk to be used in routine plant analysis, but was limited to the IPEEE purpose of discovery major fire vulnerabilities. Furthermore, the NRC has provided no basis for the determination of their suggest value of 10. If additional consideration by Exelon were performed, it would included a more realistic review of fire impacts. This more realistic review is expected to verify that the factor of 5 used by Exelon is accurate. (QC08-30)

**Response:** *The contribution to risk from fire events is discussed in detail in Section G.6.2. As noted therein, the staff believes that the information provided by Exelon was not sufficient to support a risk multiplier of five; and for reasons presented in the discussion, the staff used a multiplier of 10 in its assessment. The staff acknowledged that a more realistic assessment could result in a lower fire CDF. However, the factor of 10 multiplier was considered appropriate given the large risk contribution from external events relative to internal events, and the lack of information from the licensee on which to base a more precise risk reduction estimate for external events. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** For SAMAs #1 and #2 regarding cooling for the Safe Shutdown Makeup Pump (SSMP) room and alternate drywell spray, the NRC has already concluded only marginal risk-cost benefit exists (QC DEIS, page G-25). (QC08-31)

**Response:** *As noted in Section G.6.2, these SAMAs have a negative net value, however, they could be cost-beneficial given a more detailed assessment of their benefits in external events, or when uncertainties are taken into account. Given their potential risk reduction and relatively modest implementation cost, the staff concluded that further evaluation of these SAMAs by Exelon is warranted. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** For SAMAs #6 & #8, local electrical breaker operation would require human actions to close breakers onto energized, high voltage buses. Such actions create an industrial safety concern for the personnel performing such actions. Testing the capability to perform such actions would imposed actual hazards on personnel during the testing, while the likelihood of ever having to perform the actions during an accident are quite remote (loss of all 125 V DC power is calculated to occur roughly once per 1 million years as documented in the Quad Cities 2002 PRA). (QC08-32)

**Response:** *The staff agrees that routine testing of the capability to perform local breaker operation on an energized bus is not warranted due to the potential personnel hazard, and that the associated human actions can instead be simulated. The staff believes that given appropriate procedures and training and the skill-of-the-craft, the risk associated with these actions would be comparable to that for other industrial high-voltage work. Considering the cost-beneficial nature of this improvement, it is the staff's position that written guidance detailing the actions and the precautions associated with local breaker closure onto an energized bus is far more effective and safe if developed and trained in advance. The staff's conclusion is unchanged and further evaluation of these SAMAs by Exelon is warranted. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** For SAMAs #10 and #14, the changes suggested in the QC DEIS would require deviations for NRC-approved emergency procedure guidelines. Each would be impacted by the change suggested by the Staff as well as causing a significant deviation from the approved Boiling Water Owners Group (BWROG) strategy. (QC08-33)

**Response:** *Although the procedure enhancements associated with these SAMAs may constitute deviations from the generic Emergency Procedure and Severe Accident Guidelines, such deviations may be preferable to strict adherence to the generic guidelines and could be justified on the basis of the overall reduction in risk. The fact that a procedure enhancement may represent a deviation from the generic guidance is not a sufficient basis for dismissing the enhancement from further consideration. The staff's conclusion is unchanged and that further evaluation of these SAMAs by Exelon is warranted. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

## **A.2.10 Comments Concerning Threatened and Endangered Species Issues**

**Comment:** The Generic EIS and Draft Supplement 16 adequately address the concerns of the Department regarding fish and wildlife resources, as well as species protected by the Endangered Species Act. We concur with the preliminary conclusions of the U.S. Nuclear Regulatory Commission staff with respect to the impacts of continued operations on these

resources and species. We have no comment on the adequacy of other resource discussions presented in the document. (QC07-1)

**Response:** *The comment is noted. The commenter concurs with the staff's determination that the proposed action will not adversely impact threatened or endangered species. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

#### **A.2.11 Comments Concerning Decommissioning Issues**

**Comment:** About 15 years ago I asked a speaker for the plant what the plan was for when it was closed down. He said he didn't know, was not an engineer, but supposed that it could be cemented over. I didn't find this particularly reassuring because of the condition of many of our roads.

Is there a new technology for permanently sealing it off? (QC04-3)

**Response:** *The NRC regulations require the decommissioning of all nuclear power facilities. The environmental effects associated with the activities required to decommission a nuclear power plant were evaluated in the GEIS and found to be Category 1 issues. Additionally, the NRC staff published in 2002 the GEIS on Decommissioning of Nuclear Facilities, Supplement 1 Regarding the Decommissioning of Nuclear Power Reactors (NUREG-0586). The supplement evaluates the impact of various decommissioning alternatives for power reactors, including the entombment alternative. Entombment is a decommissioning option in which radioactive contaminants are encased in a structurally long-lived material, such as concrete. The entombed structure is appropriately maintained, and surveillance is continued until the radioactivity decays to a level permitting unrestricted release of the property. Although entombment is considered in the supplement, all commercial nuclear plants that have begun or completed decommissioning have opted to either immediately begin dismantlement or place the plant in long-term storage with eventual dismantlement and decontamination planned. No licensee has proposed entombment as a decommissioning option to date. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** *Section 7.1, Decommissioning, page 7-2, 7-3: Under bullet point Radiation Doses. As the GEIS is based on a forty-year licensing period, an extension of another twenty years would have an site-specific impact with respect to radiation doses that needs to be quantified and reported. This information should be included specifically in the final SEIS as part of the risk that would be associated with the license extension. (QC16-8)*

**Response:** *The radiation dose reported on pages 7-2 and 7-3 of the draft SEIS is the additional dose that would be incurred by the public and the workers during the decommissioning of the facility as a result of operating the plant for an additional 20 years. The NRC staff concluded in the GEIS that the incremental radiation exposures during decommissioning due to license renewal was small and could be treated generically. Therefore, no site specific analysis is needed. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

## **A.2.12 Comments Concerning Alternatives to License Renewal**

### **General**

**Comment:** Renewable energy is where all of our resources and development should be placed. (QC05-4)

**Comment:** Please find other more suitable fuel alternatives. (QC06-2)

**Comment:** Second, the NRC has not complied with its legal duty to objectively evaluate energy efficiency, renewable energy resources, and other clean energy resources as viable alternatives to the renewal of the Quad Cities operating license. (QC10-2)

**Comment:** The Draft Supplement does not adequately address the opportunities for meeting baseload power needs through efficient on-site natural gas-fired generation, such as Combined Heat and Power ("CHP"), district energy systems, and fuel cells. Such natural gas distributed generation emits substantially less air pollution than coal-fired power plants, and does not pose the high-level waste and safety hazards inherent to nuclear power, and therefore could serve as a cleaner and safer baseload supplement to energy efficiency and renewable energy alternatives. *Repowering the Midwest* [p. 83] estimates that Illinois alone has the potential for 2,162 MW of efficient distributed gas-fired generation by 2010, and 5,000 MW by 2020. (QC10-20)

**Comment:** The Draft Supplement fails to "rigorously explore and objectively evaluate all reasonable alternatives" to renewing the Quad Cities license, as required by NEPA. 40 C.F.R. [sic] 1502.14(a). In particular, the Draft Supplement erroneously rejects energy efficiency and renewable energy resources as not feasible from an economic, technological, and/or environmental standpoint. The analysis of these alternatives in the Draft Supplement is unsupported or it relies on flawed and outdated information. As explained below, energy efficiency, renewable energy sources, and clean distributed generation, in combination with "clean coal" resources, present a lower-cost, safer, and environmentally preferable approach to meeting energy needs than renewing the license for the aging Quad Cities nuclear power plant. (QC10-4)

Appendix A

**Comment:** Iowa and Illinois have a monumental [sic] opportunity to set an example for the rest of the country and help our great nation claim its energy independence. Investing in renewable energy today could create thousands of new jobs and stimulate the local economy. Efficiency is a viable alternative that could actually eliminate [sic] the need for over 127 power plants by 2010. And it does not take mass amounts of money, create toxic waste, or pollute the environment for thousands of years. (QC12-3)

**Comment:** Also of concern to me is the draft supplement's blatant misrepresentation of alternative technologies. The investigators obviously made little effort to seriously work out the details of alleged [sic] technologies which they illegally [sic] deemed unfeasible, too costly or needing too much space. Solar and geothermal alternatives are generally incorporated into existing structures, and wind turbines can share the field with crops, with farmers harvesting up to within 1 foot of the turbine tower. As a board member of the Iowa Renewable Energy Association, I know whereof I speak. I believe you have heard the same from Bennett Brown as well. So please, before you discount the benefits of renewable alternatives AND efficiency, I implore you to undergo an independent study of viable alternatives for the Quad Cities. (QC12-4)

**Comment:** There are numerous alternatives to nuclear power which are renewable; do not pollute like coal or diesel, and do not produce thousands of tons of radioactive waste which we have no feasible means to dispose of. These clean, abundant technologies have a real potential to create new job markets, boost the economy and improve the environment. (QC13-9)

**Comment:** We urge you to deny Exelon's request for an extension of their operating license for Quad Cities Units 1 and 2, and give us the opportunity to develop alternative energy sources that are renewable, do not pollute like coal or diesel, and do not generate dangerous toxic waste which we have no feasible means to dispose of. (QC13-19)

**Response:** *The SEIS for the Quad Cities Nuclear Power Station presents the staff's analysis of the environmental impacts of the proposed action, i.e., renewal of the operating licenses for Quad Cities, and of reasonable alternatives. These impacts are presented in discrete resource areas so that environmental impacts can be compared between the proposed action and reasonable alternatives. The Supplemental EIS is not an evaluation of the best mix of energy generation sources for the Illinois area or a determination regarding which mix would result in the least overall environmental impacts. The decisions regarding which generation sources to deploy are made by the licensee and State energy planning agencies, not the NRC.*

*The viabilities of the various alternatives to renewal of the operating licenses for Quad Cities are pertinent to the discussion of alternatives to the extent that an alternative is considered reasonable. However, staff recognizes that although some alternative energy sources, when*

*considered by themselves, may not be viable replacements for Quad Cities, these alternatives could be part of a combination of generation sources that could replace Quad Cities. The many possible combinations could include combined-cycle gas-fired plants, clean-coal plants, renewable energy sources such as wind and solar power, and energy conservation. A likely combination of alternatives that includes 300 MW(e) of energy conservation was chosen for discussion in Section 8.6 of the SEIS. Text has been modified.*

## Wind Power

**Comment:** And I find a section on considering wind energy as a replacement for the Quad Cities plants incomplete and in some cases misleading. (QC03-11)

**Comment:** What's misleading is to use Illinois numbers. This plant, after all, is on the border of Iowa and Illinois. Illinois has a pathetic wind resource. I don't mean that to any detriment of Illinois but it's not a windy state despite Chicago's moniker.

Iowa is a windy state. In fact, Iowa has enough Class 4 and better sites to replace the Quad Cities, both of the Quad Cities plants 20 times over. Furthermore, north of Iowa, in the Dakotas, we could easily power the entire Midwest on turbines. The only issue would be how do you get the power to the population centers? The areas that are easily developed in the Dakotas are not on transmission lines so part of the cost of developing those turbines would have to include transmission.

So the first point here that sufficient power is marginal I think is incorrect. There is more than enough wind power in the vicinity to replace the Quad Cities. (QC03-12)

**Comment:** And finally the fourth point that SEIS brings up is that wind, I forget the wording, that wind can only provide intermittent power. That the Quad Cities plants provide a base load power that simply cannot be replaced by wind. This statement is inconsistent with a variety of conclusions that utilities both within the United States and internationally have reached. (QC03-15)

**Comment:** The Draft Supplement erroneously rejects wind power, which is a viable alternative. First, the Draft Supplement improperly limits its analysis to wind resources in Illinois. As documented in *Repowering the Midwest*, six of the 10 states with the highest wind power potential in the U.S. are in the Midwest. With some improvements to the transmission grid, wind farms in neighboring states such as Iowa could be a viable source of energy for Illinois. Just as the Quad Cities nuclear power plant supplies 25% of its energy to Iowa, wind farms in Iowa can supply energy to Illinois. (QC10-10)

## Appendix A

**Comment:** As an overall comment, MidAmerica would note that it is not opposed to wind-generated power as evidenced by our past and present participation in wind generation projects. However, MidAmerica sees wind-powered generation as a complement to, and not a viable substitute for, base load nuclear generation already in existence. (QC11-1)

**Response:** *The discussion of the viability of wind power in Chapter 8 of this SEIS is presented to support the staff's conclusion that wind power alone is not a reasonable replacement for the baseload capacity provided by the Quad Cities plant. However, the staff acknowledges that wind resources are available and are being developed in other areas of the Midwest. As noted in comment QC11-1, current plans for development of wind farms clearly indicate that wind power can be an import complement to other generation sources. As such, staff agrees it is reasonable to include wind power in a combination of alternatives that could replace Quad Cities generation. Of the many possible combinations of alternatives, staff chose an alternative that includes 300 MW(e) of energy conservation for discussion in Section 8.6. Text has been modified to note reasonable combinations could include wind energy, and to briefly discuss impacts associated with construction and operation of a large-scale wind farm.*

**Comment:** But the primary comment in the SEIS statement was that it would represent a doubling of U.S. wind capacity if we were to replace the Quad Cities plants with wind. That's true but it's, again, it's a irrelevant statistic. (QC03-18)

**Response:** *The discussion of the viability of wind power in Chapter 8 of this SEIS is presented to support the staff's conclusion that wind power alone is not a reasonable replacement for the baseload capacity provided by the Quad Cities plant. As noted in the previous response, staff agrees that it is reasonable to include wind power in a combination of alternatives that could replace Quad Cities. Text has been modified.*

**Comment:** But wind turbines will take up land. A two megawatt turbine takes up about a quarter of an acre of land that you can farm right up to the turbine. If you were to replace the Quad

Cities plants, they would take about a square mile. It's not a significant consumption of land and it is an environmentally responsible consumption of land. It is a good neighbor to the farmers. In fact, farmers are clamoring to have wind turbines on their farms. I don't see a line of farmers here clamoring to have caskets on their farms. So, I think that the NRC needs to develop that section quite a bit more. (QC03-14)

**Comment:** Second, technological advancements are increasing the amount of power created by wind turbines. The largest commercially available wind turbine is 1.65MW (not 1.5MW as stated in the Draft Supplement), and will likely increase to 2.1MW in 2005, and may increase to



3MW to 5MW in the near future [Ari Reeves, *Wind Energy For Electric Power: A REPP Issue Brief* (Nov. 2003) at 22]. (QC10-11)

**Comment:** The Draft Supplement also overestimates the impact that an expansion of wind power would have. Nearly 95% of the land devoted to a wind power site remains available for other uses such as agriculture. (QC10-14)

**Comment:** The SEIS noted that a capacity of 4,200 megawatts would be necessary to replace the capacity of QCNPS. In fact, the necessary capacity would probably be even greater. MidAmerica's experience has shown that MAPP, the NERC reliability council with which MidAmerica's wind generation is accredited, actually credits wind capacity at approximately 17% of rated nameplate. This means that to replace the generating capacity of the QCNPS some 10,729 megawatts of wind generation would actually have to be installed. (QC11-2)

**Comment:** Mr. Brown also comments [see Transcript, pp. 124-125] on the NRC document noting the land use for a wind facility would be significant. Mr. Brown states that a two megawatt turbine required only a quarter of an acre of actual land use and that farmers are still able to utilize much of their land. This in fact is fairly consistent with what MidAmerica has seen with its wind project development. What Mr. Brown fails to account for is the necessary spacing for capture of the wind resource. Wind turbines must be sufficiently spaced apart to maximize capture of the available wind energy. If the turbines are too close together one turbine can impact the efficiency of another turbine. Based on MidAmerica's experience the appropriate spacing of wind turbines equates to approximately 72 acres per megawatt. This would mean the project footprint for 10,729 megawatts would entail over 772,000 acres. This is a more significant number than that cited by Mr. Brown. (QC11-8)

**Response:** *The SEIS describes the impacts of the proposed license renewal and of the alternatives to discrete environmental resources such as land use or aesthetics. These impacts are comparable between the proposed action and alternatives. The SEIS does not attempt to compare the overall impact of the proposed action to the overall impact of any reasonable alternative.*

*Staff conclusions in Chapter 8 of this SEIS, regarding land use impacts are not dependent upon any threshold value of acres per turbine. It is noted in the GEIS that after installation, turbines occupy only 10 percent of the land committed to wind generation; and most of the remaining land would be available for agriculture or other compatible uses. Impacts are associated with construction and operation. Construction impacts are due to land disturbances, air emissions, and noise during road and transmission line construction and during turbine installation. Operational impacts result from minor waste generation, noise, erosion, and aesthetic impacts of turbines, access roads, and transmission lines. Staff agrees with commenters that operational impacts on land are smaller than those that would occur during construction.*

Appendix A

*However, impacts of construction in sensitive areas and other continuing impacts during operation, such as the continuing aesthetic impact, could be large, depending on the location of the resource. These impacts do not depend critically on the exact number of acres required for the alternative. Text has been modified.*

**Comment:** In addition, wind turbines have an availability factor of 98%, higher than most other power sources [American Wind Energy Association, *The Most Frequently Asked Questions About Wind Energy* (2002), p. 5]. (QC10-12)

**Comment:** Mr. Brown also notes, at page 77 of the transcript, that 4,200 megawatts of wind generation would be about 1,000 megawatts of consistent power production throughout the year. In fact, during MidAmerica's research for development of its Iowa Wind Power Project, the Company discovered historical wind resource records showing that for approximately 10% of the available operating time there would be insufficient wind to produce any wind generation at all. Moreover, these historical records show that for approximately 37% of available operating time the wind generating facilities would be generating at less than 25% of nameplate capacity. Therefore, for nearly 50% of the available operating time, a wind facility in Iowa would likely be operating at less than 25% of its rated capacity. (QC11-3)

**Response:** *The staff agrees with the commenter (QC10-12) that suggests wind power can have a high availability factor in strong wind resource areas. However, the staff also agrees with the other commenter (QC11-3) that suggests a wind facility would operate over half of the time at a small fraction of its rated capacity. Therefore, the fluctuating generation from a wind farm would be markedly different from the generation from the Quad Cities plant, and wind power alone could not be described as a replacement of Quad Cities baseload capacity. This is not to say that wind power is not an important generation source. Current plans by utilities for the construction of new wind farms clearly indicate that wind farms are attractive additions to the mix of generation capacity available to utilities. This is acknowledged in SEIS, Section 8.2.6, which states that many combinations of alternatives are possible to replace the generation from Quad Cities. The impacts associated with construction of a new wind farm would be similar to those presented in Table 8-8 of the SEIS for the assumed combination of alternatives at an alternate site. The primary impacts would be from the construction of road and transmission lines and the continuing aesthetic impact of wind turbines and transmission lines. Other impacts, such as waste and air quality, would be smaller for a wind farm. Text has been modified.*

**Comment:** Studies have been commissioned by the independent system operators that maintain the grid. And the conclusion is that the use of wind does not represent any change necessary to the grid of the United States as long as penetration is up to 25 percent. We could replace 25 percent of our electricity generation with wind and not have to change the grid at all.

If we were to go beyond 25 percent penetration, we would have to address the fact that wind gusts. (QC03-16)

**Comment:** So, in conclusion, wind energy, I believe, is a very viable replacement for the Quad Cities plants. In neighboring Iowa, it could be done very easily. In the Dakotas it would require some transmission. (QC03-17)

**Comment:** Mr. Brown also discusses the short- and medium-term fluctuations in wind generation, noting that a penetration of 25% is viable with no change to the transmission grid. MidAmerica plans to install 310 MW of wind generation in the next three years, in Iowa. As of May 2003, this 310 MW represents approximately 7% of MidAmerica's nameplate generation. Transmission system impact studies note nineteen separate upgrades necessary to accommodate this generation. There would likely need to be significant changes and related investments in the transmission grid to accommodate an additional 18% penetration. To say that no changes would be required in the transmission grid and that Iowa could very easily accommodate a 25% penetration of wind energy is clearly not correct. (QC11-9)

**Response:** *The commenters apparently are commenting on two different aspects of the transmission system, or grid. Comment QC03-16 seems to address the overall transmission system capacity and that sufficient capacity exists to accommodate an increase in system generation up to 25%. Comment QC11-9 notes that significant local upgrades are necessary to connect a planned wind farm to the grid. For the purpose of this SEIS, it is sufficient to assume that transmission facilities would be required to be modified to connect the wind farm to the grid. It is certainly unreasonable to assume the contrary, that developable wind resources are conveniently located along transmission systems that have both facilities and sufficient capacities to allow connection to the grid without improvements. The impacts associated with the construction of these transmission facilities at alternate sites, as discussed in Section 8.2.5.2 and Table 8-8, are consistent with this assumption. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

**Comment:** Most new wind facilities would also be located near existing transmission lines. Therefore, the land impacts of new wind power would not be significant. (QC10-15)

**Response:** *This comment is presented without supporting information regarding the availability of transmission lines in areas with developable wind potential. The staff believes that significant upgrades and new transmission lines would be required to develop new wind power. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

## Appendix A

**Comment:** In addition, wind generation uses no coolant water, has no emissions and does not degrade land. (QC10-16)

**Response:** *Staff agrees that in general, impacts of waste products from wind farms is SMALL. Minor erosion may occur due to use of access roads for turbines and transmission lines. No text was modified.*

**Comment:** There are very few avian collisions with modern wind turbines [National Wind Coordinating Committee, Avian/Wind Turbine Interaction: A Short Summary of Research Results and Remaining Questions (Dec. 2002)]. (QC10-17)

**Response:** *Impacts associated with bird collisions with wind turbines are discussed in NUREG-1437, which describes bird collisions as "likely," but the anticipated number was not quantified. Text has been modified to indicate there is a potential for bird collisions with turbines.*

### Solar Power

**Comment:** Most solar power units are located on rooftops of buildings, meaning that solar power would not cause land disturbance. (QC10-18)

**Comment:** In addition, it is important to note that solar PV [photovoltaic] technology has advanced to the point where PVs are a good source of power, especially in remote areas and to help meet peak power demand. The average solar PV cell has a conversion rate of 12% to 17%, not the 10% assumed in the Draft Supplement. (QC10-19)

**Response:** *The range of conversion efficiencies in comment QC10-19 is presented without supporting information. Section 8.2.5.3 of the SEIS states that currently available photovoltaic cell conversion efficiencies range from approximately 7 to 17 percent, which generally agrees with the comment. A 10 percent efficiency was assumed as a reasonable efficiency for estimating land use requirements. However, assuming 15 percent efficiency, approximately 80 million m<sup>2</sup>, or 80 km<sup>2</sup> (31 m<sup>2</sup>) of photovoltaic cells, would be required to replace the generation capacity of Quad Cities. As a distributed generation source, solar panels could be placed on residential rooftops. Assuming an average home size of 139 m<sup>2</sup> (1500 ft<sup>2</sup>) with half of the roof space available for solar panels, each home could support about 70 m<sup>2</sup> of solar panels. As such, over 1 million homes would have to be retrofitted with solar panels to replace Quad Cities generation even with efficiency rates as high as 15 percent. However, staff agrees with the commenters that distributed solar power is an attractive addition to generation sources considered by energy planners. As noted in Section 8.2.5 of the SEIS, staff concluded that although solar power alone was not sufficient to replace the generation from Quad Cities, solar could be used in combination with other reasonable alternatives. The impacts associated with*

*construction of new distributed solar panel arrays would generally be smaller than those presented in Table 8-8 for an alternate site. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

## **Nuclear Power**

**Comment:** And as you consider alternatives to this aged plant, I think it's relevant to mention that there is an alternative site already being assessed and considered by the NRC. (QC03-10)

**Response:** *As noted in Section 8.2.3 of the SEIS, the NRC is currently reviewing applications for Early Site Permits for new reactors. An Early Site Permit under 10 CFR Part 52, Subpart A, is used to set aside a site(s) for one or more nuclear power facilities. Text has been modified.*

**Comment:** *Nuclear Power Generation Alternative, Section 8.2.3.1, Closed-Cycle Cooling System, page 8-44: Both waste impacts and human health impacts need to be specified rather than referenced to provide a clearer understanding of the risk determination made in this section of the document. (QC16-10)*

**Response:** *The comment is noted. The SEIS relies to a great degree on impact analyses presented in NUREG-1437. As a supplement, this SEIS does not need to repeat all analysis and conclusions of the GEIS. Appropriate sections of the GEIS are referenced, when necessary. A reiteration of the analysis of the waste and human health impacts related to closed-cycle cooling are presented in 10 CFR Part 51, Appendix B, Table B. This table can be found at <<http://www.nrc.gov/reading-rm/doc-collections/cfr/part051/part051-appb.html>>. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

## **Coal**

**Coal Fired Generation Alternative, Section 8.2.1.1, Closed-Cycle Cooling System, page 8-21, Under the Human Health bullet point:** Any dose estimate that would have the potential to fall within the risk range of  $10^{-6}$  to  $10^{-4}$  or greater needs to be specifically evaluated for potential regulatory requirements of risk impacts to the public health. This should be estimated conservatively using the data that is currently available or that can be logically extrapolated from currently available information. (QC16-9)

**Response:** *The SEIS for the Quad Cities Nuclear Power Station presents the staff's analysis of the environmental impacts of the proposed action, i.e., renewal of the operating license for Quad Cities; and of reasonable alternatives. It is not the staff's intention to precisely define the impacts of each alternative but rather to develop enough information to be able to compare on a relative basis, the impact categories for each alternative. As stated in Section 8.2.1.1 of this*

**SEIS, the staff has determined that the radiological impacts associated with the operation of a coal facility would be greater than those from a comparably sized nuclear plant. No risk assessment for the coal facility is required to fulfill the staff's requirements under NEPA to evaluate alternatives. The comment provides no additional information. There were no changes made in the supplement because of this comment.**

### **Conservation**

**Comment:** How about rationing energy use instead? We are a very wasteful society. Somehow its ok to kill and have our young people killed in order to keep energy available. I don't find this acceptable. (QC04-5)

**Comment:** The Draft Supplement cites a 1992 study suggesting that energy efficiency improvements cost 4 cents for every kilowatt-hour saved. The Draft Supplement then rejects this cost estimate arguing that: (1) if energy efficiency were really that cost-effective it would have already occurred, and (2) replacing the energy produced by Quad Cities would require such a large-scale energy efficiency effort that the cost of energy efficiency would increase well beyond 4 cents. The Draft Supplement, however, provides no support for these contentions and does not even attempt to estimate the cost of using energy efficiency to replace the power produced by Quad Cities. (QC10-5)

**Comment:** In contrast to the unsupported analysis provided in the Draft Supplement, recent studies demonstrate that energy efficiency is an even more viable and cost effective alternative. For example, the 2001 *Repowering the Midwest* study [Environmental Law and Policy Center, et al., *Repowering the Midwest: The Clean Energy Development Plan for the Heartland* (2001)], which is one of the most comprehensive clean energy development analyses conducted on the Midwest's energy sector, demonstrated that energy efficiency efforts can significantly reduce the demand for power at a cost of 2.5 cents per kilowatt hour or less – lower than the cost of generation, transmission, and distribution of electricity from power plants. (QC10-6)

**Comment:** Additionally, the economic benefits of greater efficiency should not be ignored. A follow-up analysis of the economic impact of the recommendations in *Repowering the Midwest* concluded that with investments in energy efficiency, 43,000 new jobs would be created and \$4.7 billion in additional economic output would be created by 2020 [Environmental Law and Policy Center, et al., *Job Jolt: The Economic Impacts of Repowering the Midwest* (2002)]. Clearly, energy efficiency is a technologically and economically feasible alternative to the renewal of the Quad Cities operating license. (QC10-7)

**Comment:** Perhaps realizing that energy efficiency alternatives cannot be rejected on their merits, the Draft Supplement also asserts that energy efficiency is not viable because utility

deregulation has removed the incentive for Exelon to invest in energy efficiency. Energy efficiency, however, is a cheaper (and less environmentally destructive) alternative to new power generation. (QC10-8)

**Comment:** Energy efficiency is the quickest, cheapest, easiest way to achieve energy independence. Adopting the household appliance efficiency standards agreed to by both the Clinton and Bush (senior) administrations would eliminate the need for 127 power plants by 2020. (QC13-5)

**Response:** *The comments are noted. The SEIS presents the staff's analysis of the environmental impacts associated with the proposed license renewal and with reasonable alternatives. Staff agrees with the commenter's statement that increases in efficiency are technically possible and could result in energy savings that could replace Quad Cities generation. As noted in the GEIS, the environmental impacts of electrical energy conservation programs are not well understood. The U.S. Environmental Protection Agency warns that indoor air quality can be impaired if energy considerations override human health considerations. Replacing older equipment with newer, energy efficient equipment involves a large manufacturing effort and creates waste equipment and byproducts of the manufacturing process. However, as discussed in Section 8.2.5.11 of the SEIS, Exelon would not pursue large-scale conservation programs unless these were mandated or an incentive were provided by a government agency because of their high relative cost. Therefore, staff disagrees with the commenter's statement that a large-scale increase in energy efficiency alone is an economically feasible alternative to license renewal. This is not to say that energy efficiency is not an important component in energy planning. Accordingly, the staff assumed that a reasonable combination of alternatives would include 300 MW(e) of energy conservation (see Section 8.2.6). The text has been modified.*

### **A.2.13 Comments Concerning Out-of-Scope Issues: Operational Safety, Aging Management, Cost of Power, and Need for Power**

#### **Operational Safety**

**Comment:** And I don't feel as a physicist that it's appropriate to renew the license for a plant that bypasses such a fundamental component of its containment and safety systems. (QC03-1)

**Comment:** I think it's unnecessary to continue operating a reactor beyond the year 2012 given that it has a fundamental design flaw. So that's the first of my objections to this particular reactor. And I would like to see the torus vent system addressed in the SEIS. (QC03-3)

## Appendix A

**Comment:** This particular plant, the core shroud on one of the reactor cores exhibited severe cracking. The NRC classifies the cracking in this study as none, slight, moderate and severe. And at the Quad Cities plant the core shroud cracking was severe, in some cases with fissures up to a half of an inch in the core shroud wall, and they hadn't yet penetrated through the wall but if they did, that would be a disastrous event. (QC03-5)

**Comment:** The components that concern me the most are the plates which keep the rods, both the control rods and fuel assembly rods in place so that if sudden insertion of a control rod is necessary, as it is every time a plant scrams, if those plates are worked or have crept [sic] or have buckled, all of these are consequences of radiation exposure of metals, then it's completely plausible that the control rods will be unable to insert as expected during a scram. If a plant fails to scram, the reaction continues and the heat has to go somewhere. That would be the torus, which brings me back to the design flaw of this particular plant. (QC03-6)

**Comment:** So, to summarize, I think there are two problems with the Quad Cities plants. Number one, they utilize an old flawed design that should be retired. (QC03-7)

**Comment:** I understand it was not constructed properly for chimney emissions and that correcting this problem would be terribly expensive. (QC04-4)

**Comment:** This plant has NOT operated without problems or violations, therefore why would you seek to continue operations of Quad Cities Units 1 and 2, beyond their useful life span of 25 years. (QC05-6)

**Comment:** The Quad Cities need to have the generator at Cordova repaired, better yet, replaced. It is no longer safe to use. (QC06-1)

**Comment:** This plant in particular has a rich history of poor routine maintenance; testing violations, equipment failure, security weakness, inoperable safety systems, and human performance errors. In light of these events, it is neither safe nor cost effective for the community, to continue to operate these reactors beyond their original lifespan. (QC13-1)

**Comment:** The concern is that separation of the neutron-absorbing material used in high density fuel storage racks might compromise safety. (QC13-2)

**Comment:** The flaw in the torus design, and the dangerous solution intended to get the plants through their 40-year license, call into question whether the licenses for flawed nuclear plants should be renewed. (QC13-3)

**Comment:** We believe that these incidents constitute concerns that relate directly to the health, safety and general well being of the surrounding population. These events characterize



a blatant disregard for the NRC's own policies, and the people and environment which they are intended to protect; and present unwarranted risks to public health, safety and general well being. (QC13-4)

**Comment:** Even with the highest NRC rating or upgrades, nuclear plants are not invincible. They can approach near-meltdown conditions through mechanical failure alone, without any security breach from outside. The Project on Government Oversight found that nuclear plants in general still remain ill equipped, under-staffed, and under-trained. Public assurances by the NRC do little to dispel this impression. (QC13-14)

**Response:** *The comments are noted. The NRC's environmental review is confined to environmental matters relevant to the extended period of operation requested by the applicant. Operational safety is outside the scope of this review. An NRC safety review for the license renewal is conducted separately. Although a topic may not be within the scope of review for license renewal, the NRC is always concerned with protecting health and safety. Any matter potentially affecting safety can be addressed under processes currently available for existing operating licenses absent a license renewal application. The comments do not pertain to the scope of license renewal as set forth in 10 CFR Parts 51 and 54. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

### **Aging Management**

**Comment:** Regarding plant performance, failure to comply with the NRC procedures and complete basic routine maintenance on schedule has incurred preliminary wear and irreversible damage to vital reactor components increasing the possibility of a mechanical failure and the likelihood of a major accident. (QC02-1)

**Comment:** The NRC has confirmed that age-related degradation of boiling water reactors will damage or destroy vital internal components well before the standard 40-year license expires. Yet the readiness of the industry to meet the projected maintenance and repair challenges is unclear. (QC02-2)

**Comment:** Reactor aging will require a major continuous effort by the industry officials to anticipate emergent age related problems and resolve them before they become a crisis. By dealing with the whole problem of age related degradation now, Federal and State regulators can insure the safety and engineering implications of multiple failures in boiling water reactors. (QC02-3)

**Comment:** In conclusion, I would just like to point out that the useful life time of a nuclear power plant is 25 years in actual practice. (QC02-7)

Appendix A

**Comment:** It is becoming abundantly clear that aging of reactor components poses serious economic and safety risk at boiling water reactors. The General Electric Mark 1, in particular, has significant inherent design flaws and lost containment integrity during nuclear accident. (QC02-8)

**Comment:** Now, the plant is designed to be able to withstand a scram. But it still ages the plant and there are a number of scrams that have occurred at this plant over the years. (QC03-2)

**Comment:** And this plant is aged. It's part of a fleet of boiling water reactors that have shown unexpected stresses due to radiation. (QC03-4)

**Comment:** And number two, they are subject to aging. That aging will be 40 years by the time of this license expiration. And the NRC study fairly clearly showed that reactors that were greater than 20 years old exhibited an unexpected spike in their aging characteristics. (QC03-8)

**Comment:** So I think to operate this for 40 years is iffy and I think to extend the license for 20 years is unnecessary. (QC03-9)

**Comment:** All of this aside even, I must stress that any extension of this plant's operations beyond it's original intended use is utterly unthinkable. Surely, this would be asking for disaster! (QC05-5)

**Comment:** There is always an unknown factor of wear and tear on these reactors; this can not be seen or accurately measured, but will over time increasingly put all life around them at higher risk. (QC05-7)

**Comment:** We consider plant life extension to be a practical program in the nation's energy policy, and believe radiation and reactor safety can be maintained over a renewal term if adequate measures are taken to manage age related degradation. (QC09-6)

**Comment:** Failure to comply with NRC procedures and complete basic routine maintenance on schedule has incurred preliminary wear and irreversible damage to vital reactor components, increasing the possibility of mechanical failure and the likelihood of a major accident. (QC13-6)

**Comment:** The useful lifetime of a nuclear power plant is approximately 25 years, in actual practice. Materials have a fixed number of cycles of strain they can bear before they begin to crack and fail. Due to radiation induced within their originally non-radioactive components, reactors and other major nuclear facilities may become dangerous to operate – or even approach – long BEFORE they show signs of physical deterioration. (QC13-11)

**Comment:** The initial licensing period wasn't based upon safety specifications. As the plant ages, the chances of accidents grow bigger. (QC14-2)

**Response:** *The comments are noted. The NRC's environmental review is confined to environmental matters relevant to the extended period of operation requested by the applicant. Safety matters related to aging are outside the scope of this environmental review. The comments do not pertain to the scope of license renewal as set forth in 10 CFR Parts 51 and 54. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

### **Cost of Power**

**Comment:** So, I think to say that it is enormously expensive to develop is only correct in a silly expense. It is expensive. Power's expensive. It takes a lot of money to build a new nuclear power plant. It takes a lot of money to operate a nuclear power plant and it takes a lot of money to develop wind. But to compare it to other fuel sources I think is simply false. It's not economically expensive to develop in comparison with other fuels. It is economically viable. (QC03-13)

**Comment:** Third, the cost of wind power has fallen dramatically since the 1980s, with an average generation cost of three to six cents per kilowatt-hour [*Repowering the Midwest*, at p. 26], so that it is now competitive with most other energy sources. In addition, because wind is free fuel, wind power generation bears no risk of fluctuating fuel prices. These technological advancements and economic advantages have led to a substantial increase in the amount of wind power installed – from 2001 through 2003 a total of 3,795 megawatts of wind energy was installed nationwide, raising the total wind energy in the U.S. to 6,374 megawatts [American Wind Energy Association, *Wind Power Outlook 2003 (2003)*; American Wind Energy Association, *Wind Energy Fast Facts (Jan. 2004)*]. Within Illinois, the first utility-scale wind project has recently begun operations and approximately 1,700 MW of additional wind projects are in various stages of development. Across the border in Iowa, there are 420 MW of wind generation installed with an additional 345 MW in development. In light of these facts, the NRC's concerns regarding the need for substantial growth in the wind industry in order for wind to be a viable alternative are misplaced, especially given that the current operating license for Quad Cities does not expire until 2012. (QC10-13)

**Comment:** MidAmerica's knowledge of the wind industry would suggest that approximately 5.0 cents/kWh is the more commonly accepted production cost figure for wind generation. That cost can be reduced through use of government subsidies (e.g., the federal Production Tax Credit and CO<sub>2</sub> credits), however, it is important to note that the federal Production Tax Credit expired on December 31, 2003, and has not yet been renewed by Congress. The federal Production Tax Credit is currently valued at 1.8 cent/kWh and the value of CO<sub>2</sub> credits is

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currently estimated at 0.4 cents/kWh, though there is still not a mature market for trading CO<sub>2</sub> credits. (QC11-4)

**Comment:** In contrast, MidAmerica's existing coal units generate at an average cost of 2.1 cents/kWh, existing nuclear units generate at a cost of 2.7 cents/kWh, and combined cycle units generate at approximately 6.0 cents/kWh. However, it should be noted that all of these units are counted as reliable and dispatchable for capacity during system peak. ("Dispatchable" used herein means the ability to control generation output to match load and economics requirements.) It should be noted that wind generation is neither reliable nor dispatchable in any given specific time of need for capacity or generation. (QC11-5)

**Comment:** Mr. Brown asserts that it is inappropriate to compare the cost of wind generation with generation based on other fuels. MidAmerica would agree that wind generation cannot be compared to other dispatchable generation since wind is not dispatchable based on system load. Wind generation is only dispatchable when the wind resource is available. However, with the above-noted subsidies, and to the extent that wind is available, MidAmerica's wind facilities will displace all other generating units in the dispatch order. This utilization makes wind generation a very important part of MidAmerica's overall generation portfolio. (QC11-6)

**Comment:** In his cost discussion, Mr. Brown also ignores the significant cost of transmission system impacts. (Mr. Brown appears to assert that his 2.0 to 2.5 cents/kWh does include outlet transmission costs, but then apparently ignores the costs of transmission system impacts.) As a member of MAPP, MidAmerica is required to meet MAPP's reliability criteria. A requirement of MAPP is that the transmission system must be sufficient such that the generation is able to deliver rated output for certain system conditions. As discussed in number 1, above, this means the transmission system would have to be upgraded sufficiently to address all impacts for the additional 10,729 megawatts of nameplate wind generation. This could be a very significant cost when taken in consideration with a wind project location and existing transmission system constraints. (QC11-7)

**Response:** *The comments are noted. As stated in 10 CFR Part 51.95(c)(2), the SEIS for license renewal does not need to discuss cost of power. In relation to alternatives, the cost of power is only presented in support of staff's conclusions regarding the viability of the alternative. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

### Need for Power

**Comment:** The NRC's analysis in the Draft Supplement fails to comply with the requirements of the National Environmental Policy Act ("NEPA") in at least two ways. First, there is no

analysis in the Draft Supplement of whether or not there is a need for the power created by Quad Cities. (QC10-1)

**Comment:** The need for power, however, is at the heart of the purpose and need statement which, in turn, serves as the baseline by which the reasonableness of various alternatives are to be measured. Without this essential factor, there is no way for the NRC to use the EIS process to accurately weigh alternatives against one another or to conclude whether it is appropriate to allow Quad Cities to continue operating for an additional 20 years. While the NRC suggests that the need for power can be considered by the State government at some later date, it clearly violates NEPA to abdicate the analysis of the "need for power" issue to non-federal decisionmakers long after the EIS process has been concluded. (QC10-3)

**Comment:** For the above reasons, the NRC should complete a rigorous and objective analysis of the need for power and reasonable alternatives such as energy efficiency, renewable energy resources, clean distributed generation, and "clean coal" resources before deciding whether or not to relicense the aging Quad Cities nuclear power plant. (QC10-21)

**Response:** *In the license renewal context, the NRC has adopted a definition of the purpose and need for license renewal reviews as providing "an option that allows power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by state, utility, and where authorized, Federal (other than NRC) decisionmakers." This purpose and need reflects the Commission's recognition that, absent findings in its safety review or NEPA analysis, the NRC has no role in the energy planning decisions of State regulators and utility officials. The underlying need for power that will be met by the continued availability of the nuclear plant is defined by the various operational and investment objectives of the licensee that may be dictated or strongly influenced by State regulatory requirements or State energy policy and programs or, in special circumstances, by Federal agencies such as the Federal Energy Regulatory Commission or Tennessee Valley Authority. These various entities may place different emphasis on lower energy costs, increased efficiency of energy production, reliability in generation and distribution of electric power, improved fuel diversity, and environmental objectives such as improved air quality and minimization of land use. Thus, the NRC's identification of the purpose and need for license renewal strikes a reasonable balance between the NRC's mission, the licensee's needs and the State's (or in limited situations, Federal agency's) objectives.*

*The comment also suggests that by not considering "need for power," the NRC is prevented from accurately weighing alternatives against one another. The NRC's role in evaluating the environmental impacts of license renewal is to determine whether the impacts of license renewal are so great that preserving the option of continued operation for energy planning decisionmakers would be unreasonable. To make that determination, the NRC examined a*

*range of alternatives that included a net reduction in electricity generation with no replacement power, demand side management and energy conservation, electricity generated from other sources, and some combination of these alternatives. The impacts from these alternatives are discussed in detail in the SEIS.*

*Lastly, 10 CFR Part 51.95(c) was developed through notice and comment rulemaking. Accordingly, there was an opportunity to participate in the rulemaking process by submitting comments on the proposed rule language. During the rulemaking, the NRC received and responded to several comments regarding consideration of the need for power and provided a detailed explanation of its decision. 61 FR 28471-28473. In addition, NRC regulations at 10 CFR Part 2.206 provide an opportunity for any person to request that the NRC undertake certain actions, including petitioning for a rulemaking. However, absent a revision, NRC regulations explicitly state that NRC evaluation of the "need for power" is not required for license renewal environmental reviews.*

*On balance, the NRC has chosen a definition of purpose and need for its Supplemental EIS and has evaluated a set of alternatives that are fully consistent with NEPA. In addition, properly promulgated regulations govern the definition of purpose and need for a license renewal EIS. Therefore, the NRC will not consider the "need for power" as part of this EIS. The comments provide no additional information. There were no changes made in the supplement because of these comments.*

**Comment:** Although the applicant's ER need not discuss the demand for power, as noted on page 1-5, citing 10 CFR 51.53(c)(2), we note it is a reasonably foreseeable action and therefore should be discussed in the NRC's final SEIS. We note that Exelon requested and received NRC approval for a license amendment to carry out an 18% power uprate, which took place in May 2002 (section 2.1.4, page 2-9). The reports documenting the uprate's impact will not be delivered until May 2004, though the NRC estimates that the uprate could increase radiological effluent releases by a corresponding 18%. The draft SEIS states that the 18% radiological effluent increase will be within NRC limits. The draft SEIS does not, however, assess the potential for future uprates and the possible effects of future uprates. We recommend the final SEIS (1) include a discussion of environmental impacts from past power uprates, (2) assess the potential for future power uprates during the extended license period, and (3) discuss potential and cumulative environmental impacts from uprates. (QC16-2)

**Response:** *The comment is noted. As stated in 10 CFR Part 51.95(c)(2), the SEIS for license renewal does not need to include a discussion of the need for power. The power uprate for Quad Cities Units 1 and 2 was the subject of a separate NEPA review in which the environmental effects of uprates were assessed (U.S. Nuclear Regulatory Commission, Letter from Stewart N. Bailey, Project Manager, Office of Nuclear Reactor Regulation to Oliver D. Kingsley, President, Exelon. Subject: "Quad Cities Nuclear Power Station, Units 1 and 2 - Environmental Assessment and Finding of No Significant Impact Related to a Proposed License*

*Amendment to Increase the Licensed Power Level," December 17, 2001). In Section 2.1.4 of the SEIS for Quad Cities, staff concludes that the uprate was not information that was both new and significant; consequently, the staff relies on the generic conclusions in the GEIS that radiological impacts are SMALL even with the power uprate. Future uprates using the existing plant configuration are unlikely. However, any future uprate would require a separate NEPA review in which the environmental impacts of the uprate would be assessed. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

#### **A.2.14 Editorial Comments**

**Comment:** What is in the DEIS (pg. xviii/14): ...specified in the National Electric Safety...

What should be in the DEIS: ...specified in the 1981 National Electric Safety...

**Why the change:** The year of the National Electric Safety Code that the NRC uses in the GEIS for analyzing this issue should be specified in the report. (QC08-1)

**Response:** *The 5-mA standard for induced shock from transmission lines was first introduced in the 1981 version of the National Electric Safety Code (NESC). The current version was published in 2002. However, the GEIS did not refer to any specific version of the NESC. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 2-13/35): ...(ComEd 2000).

What should be in the DEIS: ...(Exelon 20003a).

**Why the change:** The reference for the NPDES Permit is incorrect. (QC08-2)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 2-47/36): ...and plotted it on land that would...

What should be in the DEIS: ..and plotted it on or near land that would...

**Why the change:** Changes make wording consistent with prior sentence describing approximate location. (QC08-3)

**Response:** *The statement on page 2-47, line 36 is accurate as stated. The previous sentence on line 31 refers to the text of the University of Chicago report that describes the general*

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*location of the site. The exact position, when plotted, is on land that would be used for the Quad Cities site. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 2-48/11-16): Though he felt what he had observed had little likelihood of proving significant, he recommended 'use of due caution' during excavation.

**What should be in the DEIS:** Though he felt that the likelihood of what he observed as proving significant was remote, he had alerted appropriate plant personnel to the areas of interest and they were to use due caution during excavation operations.

**Why the change:** The replacement wording comes directly from the letter and, more appropriately, characterizes Mr. Bareis' finding in his letter. (QC08-4)

**Response:** *The statement as presented in the SEIS accurately and adequately characterizes Mr. Bareis' finding. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 4-16/17): Blank line. What should be in the DEIS: Remove line.

**Why the change:** The line appears to be unnecessary. (QC08-5)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 4-20/9): Consideration of mitigation is warranted in the vicinity...

**What should be in the DEIS:** Consideration of mitigation may be warranted in the vicinity...

**Why the change:** The wording change is in keeping with the wording used elsewhere in the report. (QC08-6)

**Response:** *The staff's conclusion is the impact of the potential for electric shock is MODERATE on the segment of the north Nelson line where calculated induced currents exceed 5 mA. Accordingly, consideration of mitigation is warranted. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 4-25/33): ...to perform routine maintenance and other activities...



**What should be in the DEIS:** ...to perform routine maintenance and other activities related to license renewal.

**Why the change:** As noted in the Environmental Report and the GEIS, the assumption used is that these additional personnel would be needed to perform those activities related to aging management activities that need to be performed as a result of the renewing the license. (QC08-7)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 4-25/34): ...these routine activities during scheduled outages.

**What should be in the DEIS:** ...these routine activities.

**Why the change:** As noted in the Environmental Report and the GEIS, the assumption used is that these additional personnel would be needed to perform those activities related to aging management activities that need to be performed as a result of the renewing the license. (QC08-8)

**Response:** *Staff agrees with the commenter that the assumption used the activities would be related to aging management activities. However, the statement on page 25, line 34 refers to the timing of the activities, not the purpose. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 4-25/35-36): ...to their permanent staff during license renewal....

**What should be in the DEIS:** ...to their permanent staff during the license renewal period....

**Why the change:** Wording change for grammatical reasons. (QC08-9)

**Response:** *Text was modified.*

**Comment:** What is in the DEIS (pg. 4-30/15-17): The Quad Cities site is in an area of moderate-to-high potential. However, there are reports of archaeological resources on the Quad Cities site.

**What should be in the DEIS:** Areas of the Quad Cities site may have moderate-to-high potential. There is a report of an archaeological resource on or near the Quad Cities site.

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**Why the change:** The archaeological reports cited as a the basis for this statement do not state that the entirety of the Quad Cities site possesses the possibility for moderate to high potential. Furthermore, there are no references cited from any State or National source (other than the University of Chicago report listed on pg 2-47) that could be used to form the basis for the conclusion regarding areas having a potential for archaeological resources. (QC08-10)

**Response:** *The reasoning for the conclusion is provided in the paragraphs below the cited statement and is the opinion of the staff. The archaeological reports cited are not the sole basis of the conclusion. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 4-31/32-33): ...for guidance on requirements for an archaeological survey when any...

What should be in the DEIS: for guidance when any...

**Why the change:** The wording change is needed to bring into it into conformance with what was committed to by Exelon in e-mail under ADAMS Accession # ML033090462. (QC08-11)

**Response:** *The statement as presented on page 4-31, lines 32-33 reflect staff's understanding of the commitment by Exelon in the referenced e-mail and is part of the basis for the staff's conclusion that the impact of the proposed action on cultural and historic properties is SMALL. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 4-32/1): ...the staff's preliminary determination is...

What should be in the DEIS: ...the staff's determination is...

**Why the change:** Wording change needed for final report. (QC08-12)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 4-39/24, 30, 32): These lines mention Exelon practices as they pertain to vegetation management in the transmission corridors. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerica and Alliant). (QC08-13)

**Response:** *Text has been modified to include the owners of other transmission lines under review.*

**Comment:** What is in the DEIS (pg. 4-40/12): ...the staff has preliminarily concluded that...

**What should be in the DEIS:** ...the staff has concluded that...

**Why the change:** Wording change needed for final report. (QC08-14)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 4-40/18): This line mentions Exelon practices as they pertain to vegetation management in the transmission corridors in this review. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerica and Alliant). (QC08-15)

**Response:** *Text has been modified to include the owners of other transmission lines under review.*

**Comment:** What is in the DEIS (pg. 4-40/19): ...it is the staff's preliminary finding that...

**What should be in the DEIS:** ...it is the staff's finding that...

**Why the change:** Wording change needed for final report. (QC08-16)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 4-44/30, 41): These lines mention Exelon practices as they pertain to vegetation management in the transmission corridors in this review. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerica and Alliant). (QC08-17)

**Response:** *Text has been modified to include the owners of other transmission lines under review.*

**Comment:** What is in the DEIS (pg. 4-44/41): ...and its contractors at the end of the consultation,

**Why the change:** It is not clear what consultation the staff is referencing in this section. (QC08-18)

**Response:** *The consultation referred to is between the NRC and the U.S. Fish and Wildlife Service (FWS). Consultation with the FWS for license renewal was completed by letter from the FWS to the NRC dated January 16, 2004. Text was modified to clarify the parties involved.*

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**Comment:** What is in the DEIS: Agency for direction on level of effort necessary for archaeological survey in such project areas, ...

What should be in the DEIS (pg. 4-46/18): Agency for guidance, ...

**Why the change:** This wording change is needed to bring into it into conformance with what was committed to by Exelon in e-mail under ADAMS Accession # ML033090462. (QC08-19)

**Response:** *The text has been modified to accurately reflect the commitment made by Exelon in its email dated October 27, 2003.*

**Comment:** What is in the DEIS (pg. 4-50/18, 37): These lines mention Exelon practices as they pertain to vegetation management in the transmission corridors in this review. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerica and Alliant). (QC08-20)

**Response:** *Text has been modified to include the owners of other transmission lines under review.*

**Comment:** What is in the DEIS (pg. 4-51/1-2): ...the staff has preliminarily determined...

What should be in the DEIS: ...the staff has determined...

**Why the change:** Wording change needed for final report. (QC08-21)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS: ...the staff's preliminary conclusion...

What should be in the DEIS (pg. 4-51/35): ...the staff's conclusion...

**Why the change:** Wording change needed for final report. (QC08-22)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 4-51/39): ...the transmission line owner, ComEd, is...

What should be in the DEIS: ...the transmission line owner, Exelon Power Delivery, is...

**Why the change:** Wording change reflects the addressee in the letter sent (ADAMS Accession #ML032660226). (QC08-23)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 8-42/7, 8-45/31 through 8-46/12, 9-8/16): These discussions of aesthetic impacts of the alternative nuclear plant are not consistent with the analysis presented in the GEIS for aesthetic impacts of license renewal for the existing plant. During the construction of the alternate plant on the Quad Cities site, impacts would [sic] be introduced that may bring the overall site to a MODERATE level of impact, however, once the alternate plant is operating and the existing site is fully decommissioned, the overall impacts would not be much different than what currently exists. As stated in the GEIS in the conclusion of the analysis of this issue, the "staff believes that the impacts on aesthetic resources would be small in the future". For this reason, Exelon believes the staff should review their conclusions with respect to their analysis of this issue. (QC08-24)

**Response:** *The staff does not rely on generic conclusions in the GEIS with regard to environmental impacts of alternatives. For the Quad Cities site, the staff concluded that a new nuclear facility located on the banks of the Mississippi River would have a MODERATE aesthetic impact. The comment provides no additional information. There were no changes made in the supplement because of this comment.*

**Comment:** What is in the DEIS (pg. 8-48/20-22): Duplicate of lines 18-19 that can be deleted. (QC08-25)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 9-5/8): ...the staff's preliminary conclusion is...

What should be in the DEIS: ...the staff's conclusion is...

Why the change: Wording change needed for final report. (QC08-26)

**Response:** *Text has been modified.*

**Comment:** What is in the DEIS (pg. 9-8/5): LARGE, under Historic and Archaeological Resources

What should be in the DEIS: SMALL, under Historic and Archaeological Resources

Why the change: This makes the wording here consistent with the conclusion in Section 4.4.5. (QC08-27)

**Response:** *Text has been modified.*

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| **Comment:** What is in the DEIS (pg. 9-8/31): ...MODERATE...

| What should be in the DEIS: ...MODERATE for that portion of the North Nelson line where the induced shock is greater than 5 ma.

| **Why the change:** This wording change clarifies the area where the impact has been analyzed as being MODERATE. (QC08-28)

| **Response:** *Text has been modified.*

| **Comment:** What is in the DEIS (pg. 9-8/32): ...considered LARGE...

| What should be in the DEIS: ...considered SMALL...

| **Why the change:** This makes the wording here consistent with the conclusion in Section 4.4.5. (QC08-29)

| **Response:** *Text has been modified.*

### **A.3 Public Meeting Transcript Excerpts and Comment Letters**

#### **Transcript of the Afternoon Public Meeting on December 16, 2003, Moline, Illinois**

| **MR. CAMERON:** All right. Good afternoon everyone. My name is Chip Cameron. I'm the Special Counsel for Public Liaison at the Nuclear Regulatory Commission. And I just want to welcome you to the NRC's public meeting today. And the subject of the meeting is the Draft Environmental Impact Statement that was prepared to help the NRC review an application that we have from the Exelon Company to renew the license for the Quad Cities Power Generating Station. And it's my pleasure to serve as your facilitator for today's meeting.

| And in that role I'm just going to try to help you have a productive meeting. We want to get to the substance of today's discussions quickly. So I'm just going to briefly cover what the format for the meeting is going to be and the ground rules and just give you an idea of what the agenda is so that you know what to expect.

| The format of the meeting is going to be divided into two parts. The first part is to give all of you information on the NRC's license renewal process, and specifically the environmental review part of the NRC's review process. And we also want to talk to you about the findings in the Draft Environmental Impact Statement. So, we'll be giving you information on that.

And the second part of the meeting is to hear from you a little bit more formally. Any formal comments that you might want to give us today on the Draft Environmental Impact Statement or any concerns that you want to express about the license renewal process generally.

And ground rules are real simple. If you have a question that you want to ask, just signal me and I'll bring you this cordless mike. And just tell us your name and affiliation, if appropriate. I would ask that only one person speak at a time. We are keeping a transcript. Mr. LeGrand is our stenographer this afternoon. And we not only want to pay attention to whomever has the floor at the moment, but one person at a time will allow us to get a clean transcript. And that will be the public record of this meeting and it will be available to whoever wants to look at it.

I would also ask you to just follow a little brevity in your remarks so that we can make sure that we hear from everyone. I don't think we're going to have a problem with time today, so just think about that when you're talking. When we get to the formal comment part, usually we use the guideline of five minutes for formal presentations, comments. But, as I said, I think we'll be able to have some leeway on that today.

The NRC is also taking written comments on the Draft Environmental Impact Statement. But I just want to assure you that anything that you say today will carry the same weight as comment that we receive in writing. And you may, you may hear things today either from the NRC or from others in the audience that will either encourage you to submit a written comment or perhaps inform any written comments that you do, that you do submit.

And we were here a few months back doing scoping. And we hopefully addressed all of the comments that you made in the Scoping Meeting in the Draft Environmental Impact Statement. But that's another thing you may want to focus on is see how your comments were treated in the Draft Environmental Impact Statement and if you want to put a finer point on that for us, do that by submitting a written comment. And the staff is going to tell you in a minute how you do that.

In terms of the agenda, we're going to go to John Tappert, who's right here, for a more formal welcome for you. And John is the Chief of the Environmental Section in our Office of Nuclear Reactor Regulation back in Washington, D.C. And John and his staff are responsible for supervising the preparation of any type of environmental review, be it for license renewal or some other type of activity.

We are then going to go for an overview of the entire license renewal process. That includes more components than just an environmental review. And we're going to ask Kimberley Corp, who's right here, to do that for us. And Kimberley is relatively new to the agency. She's been here three years but she's worked on every license renewal application on the safety evaluation side. And that will become clear as we go through some of the comments.

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After that we're going to go to Mr. Duke Wheeler, who's the Project Manager for the environmental review on the Quad Cities' license renewal application. He'll take us through the environmental review process. We'll then go on to you for any questions that you might have about the process. Then we're going to the heart of the meeting, so to speak. And we have Mr. Bruce McDowell, right here, who's going to take us through the findings in the Draft Environmental Impact Statement. Now Bruce is a team leader. The NRC uses expert consultants and contractors to help us to do the environmental review. And Bruce is the leader of that team. He's an environmental assurance manager from Lawrence Livermore National Lab, Master's in Business Administration and a Master's in Resource Economics. A lot of experience in the environmental review. He'll take us through that.

And then we're going to go to Mr. Robert Palla, who's right here. And Bob is with the NRC and he's going to talk about something called Severe Accident Mitigation Alternatives or SAGAS, as they're known. And Bob has been with the agency for about 20 years in the, some call it the dark science of Probabilistic Risk Assessment. So he has lots of experience with that. I would just thank all of you for being here today and we just want to try to answer your questions as well as we can, address any concerns here which you have to tell us.

And, John, would you like to talk at this point?

**MR. TAPPERT:** Thank you, Chip, and good afternoon and welcome. As Chip said, my name is John Tappert. And on behalf of the Nuclear Regulatory Commission, I'd like to thank everyone for coming out today and participating in this process. I hope that you find the information we will share with you today to be helpful. And we look forward to receiving your comments both today and in the future.

I'd like to start off right now by going over briefly the agenda and the purpose of this meeting. First of all, we're going to have a brief overview of the entire license renewal process. And this includes both the safety review as well as the environmental review, which is the principle focus of today's meeting.

Then we'll go over the preliminary findings in our Draft Environment Impact Statement, which assesses the impacts associated with extending the operation to the Quad Cities Units 1 and 2 for an additional 20 years. Then we'll give you some information on the schedule for the balance of our review and how you can submit comments in the future. And then finally we get to the real heart of the meeting today, which is to receive any comments that you may have today.

But first we can provide some brief context for the License Renewal Program itself. The Atomic Energy Act gives the NRC the authority to issue operating licenses to commercial nuclear power plants for a period of 40 years. For Quad Cities Units 1 and 2, those operating licenses will expire in 2012. Our regulations also made provisions for extending those operating licenses



for an additional 20 years as part of a license renewal program. And Exelon has requested a renewal for both units.

Now, an important part of the NRC's review of that license renewal application is an assessment of the environmental impact associated with extended operation. Now, we had a public meeting here last April to seek your input early in our environmental review. As we indicated at that earlier scoping meeting, we return here now today to present the preliminary results of our review. And again, the real purpose of today's meeting here is to receive your comments on our draft review.

So with that brief introduction, I'd like to ask Kimberley to provide some more information on the safety review.

**MS. CORP:** Thanks, John. As Chip said, my name is Kimberley Corp and I'm the NRC's Backup Project Manager supporting the safety review of Exelon's license renewal application for both Quad Cities and Dresden. Before I get into the discussion of the license renewal process I'd like to take a minute to talk about the Nuclear Regulatory Commission in terms of what we do and what our mission is.

As John just said the Atomic Energy Act of 1954 is a legislation that authorizes the NRC to regulate the civilian use of nuclear materials. In carrying out that authority, the NRC's mission is threefold. One is to ensure adequate protection of public health and safety, two is to protect the environment, and three is to provide for a common defense and security.

The NRC accomplishes its mission through a combination of regulatory programs and processes such as inspections, enforcement actions, assessment of licensees' performance and the evaluation of operating experience of the nuclear power plants throughout the country.

The NRC's license renewal review is similar to the original licensing process and that it involves two parts; a safety review, which includes a safety evaluation, plant inspections and also an independent review by the ACRS or the Advisory Committee on Reactor Safeguards as well as an environmental review, which Duke will discuss next.

First you might ask what does the safety review consider. There are two types of safety issues; current operating issues which are dealt with now and aging management issues that are dealt with in license renewal. Under the current operating license, the NRC's regulatory oversight deals with current safety issues. We do not wait for a plant to come in for license renewal before requiring them to address any issue.

Because the NRC has or is dealing with those issues such as security or emergency planning, we do not reevaluate them in license renewal. The license renewal safety review focuses an

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aging management issues and the program that the licensee has already implemented or will implement to maintain the equipment safely.

The safety evaluation report is independently reviewed by the ACRS. The ACRS is a group of nationally recognized technical experts in the nuclear safety area that basically serves as a consulting body to the Commission itself. They review each application as well as the staff safety evaluation report and they form their own conclusions and recommendations and report them directly to the Commission.

The environmental review evaluates the impact of license renewal on a number of areas. These areas include, among others, ecology, hydrology, cultural resources and socioeconomic issues. As I said earlier, Duke will discuss these in the environmental review in greater detail next.

The next slide will discuss the license renewal process. This slide really gives the big picture overview of the license renewal process. And as you can see from this slide, the process involves two parallel paths; safety review and environmental review. The safety review involves the NRC staff review and assessment of the technical information that is contained in the licensee's application.

There's a team of about 30 NRC technical reviewers and contractors back at the NRC Headquarters in D.C. who are conducting the safety review right now. And the team is also supported by the technical experts at three different national laboratories, including Argonne, outside of Chicago; Brookhaven in Long Island, New York; and Pacific Northwest in Washington State. So there's a lot of expertise in the team to conduct this safety review.

The staff's safety review focuses on the effectiveness of the proposed aging management program for those plant systems, structures and components that are within the scope of license renewal. The NRC staff reviews the effectiveness of these programs to ensure that the plant's safety can be maintained throughout the term of license renewal.

The safety review also focuses on the applications, time limited aging analysis. Each original design analysis that assumed a 40-year life must be reevaluated to extend the 40-year term to the 60 year renewal term. This safety process also involves audits and on-site inspections. These inspections have been conducted by a team of inspectors pulled together from both the NRC Headquarters and NRC's Regional office in Chicago.

The results of inspections were documented in separate inspection reports and the results of the staff's safety review, as well as the results of the inspection, will be documented in the Safety Evaluation Report. And a copy of that will be provided to the ACRS for an independent evaluation. Both the Regional scoping and aging management review inspections have been completed and we are in the process of writing a Safety Evaluation Report right now.

The second part of the review process involved an environmental review, which involved scoping activities and developing the Draft Supplement to the GEIS, Generic Environmental Impact Statement for License Renewal of Nuclear Plants. And eventually we will be issuing a final supplemental to the GEIS for license renewal which will address the comments received from the meeting today as well as written comments received later.

So as you can see from the slide, the final agency decision on whether to approve or deny the application will require a number of things. A Safety Evaluation Report, which documents the results of the safety review, the final supplement to the GEIS, which documents the results of the environmental review. And then inspection reports, which document the results of the Regional Inspection. All three of these reports will be factored in as well as the independent report from ACRS into the final agency decision.

And that concludes the license renewal overview process.

MR. CAMERON: Okay, thank you, Kimberley. And we'll hold questions until we hear from Duke on the environmental review process. Then we'll go out to see if there's any questions that you have.

MR. WHEELER: Good afternoon. My name is Duke Wheeler, and I am the Environmental Project Manager responsible for coordinating the efforts of the NRC staff and the national labs for the environmental review that supports Exelon's application for license renewals for Quad Cities Units 1 and 2.

The National Environmental Policy Act of 1969 requires a systematic approach in evaluating environmental impacts of proposed major Federal actions. Consideration is to be given to the environmental impacts of the proposed action and mitigation for any impacts believed to be significant. In addition, alternatives, including taking no action on the applicant's request are also to be considered in our environmental review.

The environmental impact statement is a disclosure tool and it does involve public participation. NRC regulations required that an environmental impact statement will be prepared for proposed license renewals.

Simply stated, our decision standard basically asks are the environmental impacts of the proposed action great enough that maintaining the license renewal option is unreasonable. And I'd like to point out that we do not decide whether or not a plant's going to run for an additional 20 years. Other regulatory agencies and the licensee make that decision. Kimberley had shown you a slide of the overall license renewal process. And the bottom line along that slide indicated the steps that we go through for an environmental review. And this is an expansion of that slide. And basically we start with the application being submitted by Exelon. That took place January 3rd of this year. And then we make known to the public via the

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*Federal Register* and other means that we are going to be doing an environmental impact statement. We publish what is referred to as a Notice of Intent to develop an environmental impact statement.

That leads us right into the scoping process. And this is our first opportunity for significant public participation in what we do. The purpose of the scoping process is basically to give the public an opportunity to provide information to us to help us basically scope out the bounds of the environmental interest that we should take as we continue on with our review.

We conducted a site audit and we were out at the site in Quad Cities March 2003 of this year to gather substantial amount of information. And for whatever additional information we require, we'll send a formal request for additional information to the licensee. We did that. The licensee responded. We now take into consideration all the information that we have in our hands and we publish a draft of our environmental impact statement.

And this is where we are right now. We published that draft last month and then one of the things that we do, it's published for public comment. And to assist, to provide one additional avenue of the public providing us comments on the draft environmental impact statement is we have this meeting put together for that purpose.

There are also other ways you can provide information to us. As Chip indicated, I'll get to that as we get toward the end of the meeting.

The final step is after we've gotten all the comments that we received on the draft of our environmental impact statement, we will publish a final environmental impact statement. And our schedule provides for us to produce that final environmental impact statement in July of 2004.

This concludes my overview up to this point. I'd like to turn the meeting back over to Chip. And then we'll get into the meat of our findings.

**MR. CAMERON:** Okay, thanks, Duke. I wanted to see if there's any questions about the process, license renewal process, either safety or environmental before we go on. And for those of you who don't have a copy of this draft, EIS is on the table outside the meeting room.

Any questions about the process at this point? Okay. Let's go to Bruce for a description of the findings and the draft environmental impact statement. Bruce?

**MR. MCDOWELL:** I'm Bruce McDowell from the Lawrence Livermore Laboratory. I'm the task leader for the team that wrote the supplemental environment impact statement for the Quad Cities.

This slide shows our analysis approach. The Generic Environmental Impact Statement for License Renewal, NUREG-1437, identifies 92 environmental issues that are evaluated for license renewal. Sixty-nine of these issues are considered generic for Category 1, which means that the impacts are the same for all reactors with certain features such as plants that use water from large rivers.

For the other 23 issues referred to as Category 2, the NRC found that the impacts were not the same at all sites. And therefore site specific analysis was needed. Only certain issues addressed in the GEIS are applicable to the Quad Cities plant. For those generic issues that are applicable to Quad Cities, we assessed if there was any new and significant information related to the issue that might change the conclusion in the guidance.

If there is no new information then the conclusions of the GEIS are adopted. If new information is identified and determined to be significant, then a site specific analysis would be performed. For the site specific issues related to Quad Cities, the site specific analysis was performed. Finally, during the scoping period the public was invited to provide information on potential new issues. And the team, during their review, looked to see if there were any new issues that needed evaluation.

For each issue identified in the GEIS, an impact level is assigned. These impact levels are consistent with the Counsel on Environmental Quality. For a small impact, the effect is not detectable or too small to destabilize or noticeably alter any important attribute of the resource. For example, the plant may cause the loss of adult fish at the intake structure. If the loss of fish is so small that it cannot be detected in relation to the total population of the river, the impact would be small. For a moderate impact, effect is significant to alter noticeably but not destabilize important attributes of the resource. Using the fish example again, if losses at the intake causes the fish population to decline and then stabilize at a lower level, the impact would be moderate.

And finally for an impact to be considered large, the effect must be clearly noticeable and sufficient to destabilize important attributes of the resource. So if the losses at the intake cause the fish population to decline to the point where it cannot be stabilized and continues to decline, then the impact would be large.

The team that evaluated the impacts for the Quad Cities plant, evaluated several different areas and they're shown on this slide; socioeconomic and environmental justice, — science, terrestrial ecology, land use, archaeology and historical resources, radiation protection, nuclear safety, regulatory compliance in aquatic ecology and hydrology.

The staff has considered information from a broad range of sources during the development of this draft supplemental EIS. We have considered the licensee's evaluation of environmental impacts that was submitted with the license application. We have conducted a site audit which

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is the site visit. The staff visited the plant and interviewed plant personnel. We have talked to Federal, State and local officials as well as local service agencies.

In addition, we have also considered all of the comments received from the public during the scoping period. These comments are listed in Appendix A, along with NRC's responses. The information received from all these sources is the basis for the analysis and the preliminary conclusions in the draft SEIS that you have in front of you.

In Chapter 2 of the draft SEIS, we discuss the plant and the environment around the plant. In Chapter 4, we then looked at the potential environmental impacts for additional 20 years of operation for the Quad Cities nuclear station. The team looked at issues related to the cooling system, transmission lines, radiological impacts, socioeconomic impacts, ground water use and quality, threatened and endangered species.

Each of these issues are discussed in detail in the draft SEIS and I'll take a few minutes to highlight, to identify the highlights of our review.

One of the issues we looked closely at is the cooling system for the Quad Cities plant. This slide shows the layout of the cooling system intake and discharge canals. Although there are a number of Category 1 issues related to the cooling system, and remember we said the Category 1 issues are those that have been determined to have the same significance for all plants.

No new and significant information was identified during scoping by the applicant or by the staff during their review of the issues.

The issues that the team looked at on a site specific basis include entrainment and impingement of fish and shellfish, heat shock and enhancement of microbiological organisms. The potential impacts in these areas were determined to be small and no additional mitigation was warranted.

Radiological impacts are a Category 1 issue. As you recall this means that the NRC has made a generic determination that impacts resulting from radiological releases during nuclear plant operations are small. But because it is often a concern to the public I wanted to take just a minute to briefly discuss it.

During the site visit we looked at the release and monitoring program documentation. We looked at how the gaseous and liquid effluents were treated and released as well as how the solid waste were treated, packaged and shipped. This information is found in Chapter 2 of the draft SEIS. We looked at how the applicant determines and demonstrates that they are in compliance with the regulations for release of radiological effluents.

The licensee monitors the near site and on site locations for airborne releases and direct radiation. There are other monitoring stations beyond the site boundary including locations where water, milk, fish and food products are sampled. The releases from the plant and the resulting outside potential doses are not expected to increase on a year to year basis during the 20-year license renewal term. No new and significant information was identified during the staff's review, the public input during the scoping process or the evaluation of other available information.

The generic EIS determined that the impacts of the 69 Category 1 issues were small based on the information known at that time. As part of my team's review, we looked at all information collected during the scoping process to identify any information that was both new and significant with regard to any of these issues.

We looked at information developed by the licensee, information developed independently by my team and information received during the public comment process. We determined that none of the information was both new and significant. Therefore, the conclusions of the generic EIS or adopted in this draft supplemental EIS.

The last issue from Chapter 4 I'd like to discuss is that of threatened and endangered species. The only Federally listed aquatic species that currently occurs in the vicinity of Quad Cities site is the Higgins Eye pearly mussel. Essential habitat for this species is located about one mile downstream from the plant.

There are a number of terrestrial species listed as threatened or endangered that could occur in the range of the Quad City site and the transmission lines. These include the bald eagle, Indiana bat, the river otter, the Iowa Pleistocene Snail and the western hognosed snake. During winter migration bald

eagles visit open water in the Mississippi River caused by the plant's thermal discharges. They also use the area for summer nesting and a known nest is about eight miles north of the site.

The Indiana bat, river otter, Iowa Pleistocene Snail and western hognosed snake could occur in the counties where the plant's transmission lines are located. But since the licensee does not plan any refurbishment or construction as part of relicensing, the natural area where these species would be found would not be disturbed.

This would also be true for the three threatened plant species; the eastern and western prairie fringe orchid and the prairie bush clover. The staff's preliminary determination is that the impact of operation of Quad Cities plant during the license renewal period on threatened and endangered species would be small.

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The staff also considered cumulative impacts. These are impacts that are minor when considered individually but significant when considered with other past, present or reasonably foreseeable future actions regardless of what agency or person undertakes the other actions.

The staff considered cumulative impacts resulting from operation of the cooling system, operation of the transmission lines, releases of radiological and radiation material, sociological impacts, ground water use and quality impacts and threatened and endangered species impacts.

These impacts were evaluated to the end of the 20-year license renewal term. The geographical boundary of the analysis was dependent upon the resource. For instance, the area analyzed for transmission lines was different than the area analyzed for the cooling water system. The staff's preliminary determination is that cumulative impacts resulting from the operation of the Quad Cities plant during the license renewal period would be small.

The team also looked at uranium fuel cycle and solid waste management and decommissioning. All issues for uranium fuel cycle and solid waste management as well as decommissioning are considered Category 1. For these issues, no new and significant information was identified.

Our team evaluated the potential impacts associated with the Quad Cities plant not continuing operation and replacing this generation with alternative power sources. In 2001, Quad Cities Units 1 and 2 generated 13 billion kilowatt hours of electricity. The team looked at no action alternative, new generation from coal-fired, gas-fired and nuclear, purchased power, alternative technology such as wind, solar and hydropower and then a combination of alternatives.

For each of the alternatives, we looked at the same type of issues. For example, land use, ecology, socioeconomics, these same issues that we looked at for the operation of the Quad Cities during the license renewal term. And for two alternatives, solar and wind, I'd like to describe the scale of the alternatives that we considered because the scale is important in understanding our conclusions.

First solar. Based upon the average solar energy available in Illinois and the current conversion efficiencies of solar panels, these cells would produce about 100 kilowatt hours per square meter per year. As such, 120 million square meters or about 46 square miles cells would be required to replace the generation of the Quad Cities plant.

Regarding wind power, wind turbines have a capacity factor between 30 and 35 percent. As such, at least 4,200 megawatts of wind power would have to be developed to replace Quad Cities 1800 megawatts. To put this in context, in 2002 total wind power capacity in the United States was 4,500 megawatts. In other words, the total wind power in the United States would have to double to replace the generation from Quad Cities.



Due to these scale issues and other siting requirements of reasonable alternatives, the team's preliminary conclusion is that the environmental impacts of alternatives, at least in some impact categories, is moderate or large.

So to review our approach. In their Generic Environmental Impact Statement, NRC examined environmental issues at all sites and found that the same conclusion could be made for 69 Category 1 issues. In our analysis we found no information that was new and significant. And we adopted the generic EIS conclusions. We also performed site specific analysis for Category 2 issues applicable to Quad Cities, as I've just discussed. Lastly, we found no new impacts that were not discussed in the Generic Environmental Impact Statement.

To summarize our findings, for 69 Category 1 issues presented in the generic EIS, we found no information that was both new and significant. Therefore, we adopted the conclusions of the generic EIS. Our team analyzed the remaining issues in this supplemental EIS. And we found that the environmental affects resulting from these issues were also a small significance with one exception.

On one segment of the transmission lines, the induced currents were calculated to be six milliamps. Since this slightly exceeds the NESC standard of five milliamps, we judge the impact to be of moderate significance. Since this line is not owned by the licensee, NRC has notified the owner of our findings.

And I will take it back to Chip if there's any questions.

MR. CAMERON: Okay, we're going to go to Bruce before questions in a minute and also hear from Bob Palla on accidents. But we're going to exercise a little bit of flexibility now to allow one of our local government officials to present some remarks to us so he can make another meeting. And Mr. Jim Bohnsack, who is the Chairman of the Rock Island County Board of Supervisors.

Jim, do you want to come up and we'll ask Bruce to take a seat and you can come up here and give us your comments. Thank you.

MR. BOHNSACK: Thanks, Chip. And I appreciate it and I apologize. It's difficult to meet but I really appreciate having an opportunity to speak. And my opportunity to speak is the same what I did the last time. And one of the problems we're having with Exelon is, and it's the major company, that's refusing to pay any property taxes in the Quad City area and that comes to about four million dollars a year. And they protested their taxes last year. They also did it again this year. And if we were to lose that that's \$8 million that comes out of the coffers out of the county and somebody has to make that up.

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And all we're asking in Rock Island County is for the people to pay their fair share. People that own homes do pay their fair shares. All companies have the right to protest their taxes and they do and we have a settlement. But when you have a company like Exelon that comes in and tells you that their property is worth nothing and when they're generating what we understand is a million dollars a day out of that facility and their taxes are about \$4 million, it's pretty hard for us to believe that that facility is worth nothing.

Also they've come back and made an offer of \$33 million of a ramping down, as they call it. And they've done that to other ones. And now just last week they came and protested them again. Now they're saying \$22 million. So, when you look at a large company like that that I think is very ruthless to talk about the value is zero. It's \$33 million, it's \$22 million. And so we have concerns on really how to operate their facility. And I understand the local people doing an excellent job. And we don't want them to leave, that's for sure. We want them to pay their fair share.

QC01-2| If they don't pay that and we look at endangered species, you're going to see some very big children that are going to be endangered in that area school system. They pay about \$2 million in that school system. And I believe it's very important that they pay their fair share of taxes. And I'm just sure that the farmer's not going to be able to pay that kind of money for their children. And they shouldn't if you have businesses that are very, very good at doing what they're doing and making money. They ought to pay their fair share.

So I guess my biggest comments are that we do need your help from the environmental to some how put the pressure on companies like Exelon that they pay their fair share of taxes and then they should be able to continue to operate for 20 years. But if they operate for another 20 years and they pay no taxes, I'm telling you we are spending a considerable amount of money trying to get it assessed, the value that we believe that it should get assessed at.

Preliminary says we've got them valued at \$68 million and that it should be somewhere around \$120 million from a company that we've hired. And it's costing us thousands and thousands and thousands of dollars to get that kind of information, which is taking money out of everybody's coffers and making everybody else pay more money so we can provide the services in Rock Island County that we should do.

I appreciate you letting me speak early. I apologize that meetings are getting pretty complex. But thank you very much.

MR. CAMERON: Okay, thank you, Mr. Bohnsack. And his remarks will be reflected in the record of today's proceeding.

We are going to go to others who want to speak after we get done with the information portion of the session. And before we go to severe accident mitigation alternatives, why don't we see if

there's any questions for Bruce on the findings in the draft Environmental Impact Statement. He covered a lot of different — the team looked at a lot of different potential impacts including socioeconomic.

Any questions for Bruce at this point?

Yes, and let me get you on the transcript. And if you could just give us your name and affiliation, if appropriate.

MS. PERRIGO: Hi, I'm Leslie Perrigo with IECAN. I was just wondering if you could repeat the figure on the amount of wind power we would need to make up for the power plant?

MR. MCDOWELL: I can repeat all the figures. Wind capacity factors between 30 and 35 percent. As such, at least 4200 megawatts of wind power would have to be developed to replace Quad Cities 1800.

Is that it?

MR. CAMERON: And Leslie, what's the full name of your group?

MS. PERRIGO: The Independent Environmental Conservation Act is the Network.

MR. CAMERON: And the acronym is pronounced?

MS. PERRIGO: IECAN.

MR. CAMERON: IECAN, okay. Thank you, Leslie. Other questions? Let's go right here and then we'll go back to Neill. Please tell us your name.

MR. WHITT: Joshua Whitt, we represent the Rock Island Taxing Bodies. And we just had a quick question. Where you have your conclusions and recommendations, we understand that these are generic statements, but what does this mean for the entire process? I mean, does it make it more likely? Less likely? What affect does it have on the process of relicensing the facility?

MR MCDOWELL: Are you talking about the decline in the tax revenues?

MR. WHITT: No, I'm just talking about conclusions and recommendations. What affect does that have on the likelihood of renewing the license?

MR. MCDOWELL: Any particular conclusion and recommendation?

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MR. CAMERON: I think what he wants, perhaps, and I'm sorry to interrupt you, Mr. Whitt, but maybe it would be useful if someone described how the environmental review comes together with the safety review and how that decision, all of that is weighed perhaps. Is that what you need to know? All right. John Tappert.

MR. TAPPERT: Your question is is the conclusion and how is that factored into the decision?

MR. WHITT: Yes.

MR. TAPPERT: The reason we're doing these environmental reviews is because of the law that Duke referred to, which is the National Environmental Policy Act. And the purpose of that law was to make sure that agencies made informed decisions. What we're trying to do with this review is reveal all the environmental impacts, to provide our senior decision makers all the information available when they make their final decision.

The finding that we make preliminarily in this draft is that the impacts from license renewal are not so adverse to preclude future energy policy makers renewing the license or using the facility. So, it's not dispositive. It doesn't determine whether it's going to be renewed or not. But if we make that finding in the safety review, which Kimberley spoke about, also comes out with no safety issues, it's highly likely that the Commission will renew the license.

MR. WHITT: Just out of curiosity, at what point is the safety analysis at right now and when will that report be coming out?

MR. CAMERON: And can we go through the full schedule of when the safety analysis is done, when the environmental review is done and when we expect a final decision on the license renewal application?

MS. CORP: The Safety Evaluation Report will be issued with open items February 16th of next year. Then it will go to the ACRS for their independent review and analysis. And then they will give their recommendation to the Commission. And we will issue the final SER in July of next year. And according to the schedule, since there were no petitions to intervene, the Director of NRR has the capability to make the decision. So the recommendation will be given to the Director of NRR. And that is set to be given to him in November.

MR. CAMERON: Okay, so it's Office of Nuclear Reactor Regulation. So basically we have the final environmental impact statement in the April, in the July time frame. We have the final Safety Evaluation Report in the same time frame. And that is after the Advisory Committee on Reactor Safeguards looks at it. So, pardon me?

MS. CORP: The ACRS —

MR. CAMERON: Okay, the ACRS looks at it in April and then a final decision will be made in the November time frame. Okay? All right. Thanks for asking that question because that's good information to have on the record.

Is there any other questions about process, schedule? Oh, Neill has a question. And introduce yourself to us, please.

MR. HOWEY: I'm Neill Howey from Illinois Emergency Management. I just had a curiosity question, follow up to this young lady's question about wind turbines. Do we know what a typical electrical output of one of those single wind turbine generators is?

MR. MCDOWELL: I think the assumption that we used was, I can get to you after the meeting. I can show you the assumptions that we used in our analysis.

MR. CAMERON: Okay. And was there any implication or concern behind the question, Neill, that you want to follow up?

MR. HOWEY: I just wondered how many —

MR. CAMERON: Okay, just wondered how many it would take to replace it.

MR. MCDOWELL: We have that in the document. I can —

MR. CAMERON: Okay. And if you find it before we're done we can put it on the record.

MR. MCDOWELL: Sure.

MR. CAMERON: Yes, and just tell us your name.

MR. MAHER: Bill Maher with Exelon Corporation. The answer to Neill's question is anywhere from 2,800 to 4,900 of the wind turbines, depending on whether the capacity is one megawatt to one and-a-half megawatts.

MR. CAMERON: Okay. And Bruce, you can, if you have anything else on that later we'll put that on the record.

MR. MCDOWELL Well, I remember that it was around one megawatt.

MR. CAMERON; Okay, other questions before we go to severe accident mitigation alternative? All right, thank you very much, Bruce.

Let's go to Bob Palla from the NRC on severe accidents.

## Appendix A

**MR. PALLA:** Hi, my name is Bob Palla and I'm with the Probabalistic Safety Assessment Branch of the NRC. And I'm going to be discussing the environmental impacts of postulated accidents. Section 5 of the GEIS is entitled, Environmental Impacts of Postulated Accidents. The GEIS evaluates two classes of accidents; design-basis accidents and severe accidents.

Design-basis accidents are those accidents that both the licensee and the NRC staff evaluate to ensure that plant can safely respond to a broad spectrum of postulated accidents without risk to the public. The environmental impacts of design basis accidents are evaluated during the initial licensing process and the ability of the plant to withstand these accidents has to be demonstrated before the plant is granted a license.

Most importantly, a licensee's required to maintain an acceptable design and performance capability throughout the life of the plant including any extended life operation. Since the licensee has to demonstrate acceptable plant performance for the design-basis accidents throughout the life of the plant, the Commission has determined that the environmental impact of the designed basis accidents are of small significance.

Neither the licensee nor the NRC is aware of any new and significant information on the capability of the Quad Cities plant to withstand design basis accidents. Therefore, the staff concludes that there are no impacts related to design-basis accidents beyond those discussed in the GEIS.

The second category of accidents evaluated in the GEIS are severe accidents. Severe accidents are, by definition, more severe than design-basis accidents because they result in substantial damage to the reactor core. The Commission found in the GEIS that the risk of a severe accident in terms of atmospheric releases fall out onto open bodies of water, releases the ground water and societal impacts are small for all plants. Nevertheless, the Commission determined that alternatives to mitigate the consequences of severe accidents must be considered for all plants that have not done so.

We refer to these alternatives as severe accident mitigation alternatives or SAMA, for short. The SAMA evaluation is a site specific assessment and is a Category 2 issue as explained earlier. The SAMA review for Quad Cities is summarized in Section 2 and described in detail in Appendix G of the GEIS supplement.

The purpose of performing the SAMA evaluation is to ensure that plant changes with the potential for improving severe accident safety performance are identified and evaluated. The scope of potential plant improvements that were considered included hardware modifications, procedure changes, training program improvements as well as other changes. Basically a full spectrum of plant changes and other potential changes. The scope includes SAMA's that would prevent core damage and SAMA's that improve containment performance given that a core damage event would occur.

The SAMA evaluation consists of a four step process. The first step is to characterize overall plant risk and leading contributors to risk. This typically involves the extensive use of the plant specific probabilistic risk assessment study, which is also known as the PRA. The PRA is a study that identifies the different combinations of system failures and human errors that would be required for an accident to progress to either core damage or containment failure.

The second step in the evaluation is to identify potential improvements that could further reduce risk. The information from the PRA such as a dominant accident sequences is used to help identify plant improvements that would have the greatest impact in reducing risk. Improvements identified in other NRC and industry studies as well as SAMA analysis for other plants are also considered.

The third step in the evaluation is to quantify the risk reduction potential in the implementation costs for each improvement. The risk reduction in the implementation cost for each SAMA are typically estimated using a bounding analysis. The risk reduction is generally over estimated by assuming that the plant improvement is completely effective in eliminating the accident sequences it is intended to address.

The implementation costs are generally under estimated by neglecting certain cost factors such as maintenance costs and surveillance costs associated with the improvement. The risk reduction and cost estimates are used in the final step to determine whether implementation of any of the improvements can be justified.

In determining whether an improvement is justified, the NRC staff looks at three factors. The first is whether the improvement is cost beneficial. In other words, is the estimated benefit greater than the estimated implementation cost of the SAMA. The second factor is whether the improvement provides a significant reduction in total risk. For example, does it eliminate a sequence or a containment failure mode that contributes to a large fraction of plant risk.

The third factor is whether the risk reduction is associated with aging affects during the period of extended operation, in which case, if it was, we would consider implementation as part of the license renewal process.

The preliminary results of the Quad Cities SAMA evaluation are summarized on this slide. Two hundred eighty candidate improvements were identified for Quad Cities based on review of the plant specific PRA, relevant industry and NRC studies on severe accidents and SAMA analysis performed for other plants.

Exelon reduced this list to a set of 15 potential SAMA's based on a multi-step screening process. Factors considered during the screening included whether the SAMA is applicable to Quad Cities. It may not be applicable if it was, for example, identified for a different reactor type. We also considered whether the SAMA would involve major plant modifications that

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would clearly exceed the maximum obtainable benefit or whether the SAMA would provide only a minimal risk reduction based on the review of the PRA.

A more detailed assessment of the conceptual design and cost was then performed for each of the 15 remaining SAMA's. This is described in detail in Appendix G of the GEIS supplement. The cost benefit analysis shows that four of the 15 SAMA's are cost beneficial when evaluated in accordance with NRC guidance for performing regulatory analysis. All four cost beneficial SAMA's involved procedure improvements rather than hardware modifications.

As shown on this next slide, the cost beneficial SAMA's involve developing procedures to operate equipment locally during the loss of 125 volt buss by using temporary connections to the second unit. The second SAMA involves procedures to manually control feedwater given the loss of 120-volt DC control power. The third SAMA involves developmental procedures to terminate reactor depressurization prior to the lose of the steam driven injection pump so that core cooling could be maintained.

And the fourth, SAMA involves procedural changes to control containment pressure during containment venting in order to assure that adequate suction head for injection pumps is maintained. None of these SAMA's are related to managing the affects of plant aging. Therefore, none of the SAMA's are required to be implemented as part of license renewal.

So to summarize, the NRC's staff's preliminary conclusion is that additional plant improvements to further mitigate severe accidents are not required at Quad Cities as part of license renewal.

I'll take any questions you may have.

MR. CAMERON: Okay, thank you, Bob. I suppose one question that people might have is if the four cost beneficial SAMA's are not required for license renewal, what happens to those in terms of the NRC process, licensee implementation?

MR. PALLA: Well, at this stage, these are preliminary conclusions. We would expect to have some further dialogue with the licensee in these areas, and conceivably would transfer these over to the safety side. These are not real issues for part of renewal. But we would pursue these as operating plant issues under the current operating license.

MR. CAMERON: Because Kimberley pointed out that current operating framework, you would plug these into that framework.

MR. PALLA: Yes, we would consider whether they were justified.

MR. CAMERON: All right. Questions for Bob on the SAMA evaluation? Anything on that?



Okay, Bob, thank you very much.

I'm going to ask Duke to wrap up here in terms of conclusions and more importantly, perhaps, how you submit comments on everything in the draft EIS including the SAMA evaluations. Duke?

MR. WHEELER: Thank you, Chip. Our preliminary conclusions after all of that are first of all that the impact of license renewal are small for all the areas with the exception that Bruce pointed out. There's one part of the North Nelson Transmission line where the report that we got from Exelon was that the calculated induced current was 6 milliamps compared to the National Electric Safety Code specification of 5 milliamps.

And what we did with that was informal correspondence. I did send a letter out to the corporate entity that owns, operates and maintains that transmission line and basically said, here's what we found. In line with the intent of the National Environmental Policy Act, we are disclosing this to you.

The impacts of alternatives to license renewal range anywhere from small to large, to summarize a good part of Bruce's presentation. And so our bottom line, preliminary recommendation is that the adverse impacts of license of renewal for Quad Cities Units 1 and 2 are not so bad that preserving the option would be unreasonable.

And this just gives us a couple more of the key dates coming up for the environmental review. We did issue the environmental impact statement back in November per the prescribed schedule. For the comment period that we are in presently ends on January the 27th next year. I make one comment on that. Any comments that I receive prior to that time will be addressed in the final environmental impact statement that's going out in July. But I'm not going to slam the door shut on July the 27th as I leave the office. If comments come in later and it is still practical for me to consider those comments and address them in the final EIS before we go into our final manuscript and send it out to the print plant, then I will do that. And the final date is noted on the slide for issuing the environmental impact statement is July of 2004.

This slide just identifies myself as your primary point of contact with our staff on this environmental impact statement. And a few other ways that the document is made available to you, three libraries in the local area, the Cordova District Library and, welcome aboard, the River Valley Library at Fort Byron and also the Davenport Public Library. I've been on the phone with them and when we did mail out the environmental impact statement to our mailing list, they all did receive copies of the environmental impact statement. It's there for you to take a look at.

In addition, if you have a computer at home and can get on line, there's information on this slide which let's you know how you can go about accessing the environmental impact statement

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electronically. It's kind of a long drawn out link. If you have any problems with it, give me a phone call and you and I will sit there at the keyboards, you at yours and me at my keyboard and we'll go through it one keystroke at a time if that's what it takes for you to access this through our external web site.

Other ways of providing comments. That you may certainly also send snail mail, if you will, to the NRC staff. And I would ask that you use the address that's on this slide. The Chief of our Rules and Directives Branch, one of the advantages of using that part of our staff is that guarantees that your comments will go into the public record.

And if just by chance somebody happens to be in the area of Rockville, Maryland, during the comment period, you're certainly welcome to stop by and make comments to me. I will jot them down and they will go into the public record. And also we have established an e-mail address for the expressed purpose of receiving comments on the Quad Cities license renewal environmental review. And that e-mail address is at the bottom of the slide there. And I'm the person that opens up that e-mail address every day. And if I'm not in, there's two other, two or three other people who have access to it. And you may certainly do that. Anything that comes in by way of e-mail will become part of the official record.

And there's kind of an underlying thought on ways that we will and will not accept public comment. Bottom line is we want it in a form that we can make it a matter of public record, which means at the open house out here, preceding this meeting. We would discourage you from coming up to one of the staff with your comments unless you had a piece of paper to hand to us. We want it to be something that can be made a matter of record. And words that just disappear into the air don't fit that.

If you have any documents that you would like attached to the transcript that is being developed for this meeting, give those documents to me and I will attach those documents to the transcript as long as it is not completely impractical, if it's not three ring binders full of stuff.

This concludes my prepared remarks and if there are any questions, I'd be happy to entertain them. Otherwise, I'll turn it back over to Chip.

MR. CAMERON: And Duke, just to put another sort of a slant on what you said about discouraging comments, you're not talking about discouraging people from talking to us about issues. But if they want to get their comment on the record they should do it in here or in writing.

MR. WHEELER: Absolutely. If it's a comment that's substantive, it's related to one of the environmental disciplines that we examine. If you meet me outside in the hallway and just say, hey, I know of four more bald eagle nests within eight or ten miles of the site, I would ask, at a minimum, that you either write that down and hand it to me and I'll put it on the transcript or take

my e-mail address, go back to a keyboard, send it in to me, give it to me in some form that I can get it into the record.

Now, if it's a comment about general process, well, how long does it take to get the environmental impact statement out? How sacred is that July date? That I don't take as a comment on the substance of the environmental review. And we can talk that over the telephone or face to face without it having to be written.

MR. CAMERON: Okay. And just one other question in terms of the comments that do come into us, Duke, can people look at the web site and see what comments other people have submitted? Is that part of the public, you mentioned it's part of the public record. But is it part of the public record then so that people can look at them.

MR. WHEELER: Yes, after a fashion. Now, people cannot get into this e-mail address and go look and see all the e-mails that's been received. However, I will print out that e-mail and I'll send it over to our document control people. And, you know, with a specification that this be scanned into the public record. And then you get into another arena that a lot of people have come to know and love with the NRC, the ADAMS, Agency Document Management Access System. And that is publicly available. So after a period of time through a process, yes. If anybody here would like to see what I received at that e-mail address, you'll be able to do it. What I would strongly suggest doing is getting on the phone with me telling me of your interest and I'll help you through it.

MR. CAMERON: That's great, Duke, to offer to do that. Thank you very much.

Are there any final questions before we go to hear from those of you who wanted to make comments? Any questions for Duke about schedule and as Mr. Whitt question emphasized, the answer to that question is that the environmental review is one part of what the NRC looks at in making its decision on the license renewal application. There's also the safety evaluation that Kimberley talked about.

Questions? Okay, thank you very much, Duke. And we have three commenters. And there's Leslie Perrigo from IECAN and then we're going to go to Joshua Whitt — Bohnsack? Okay, great. So we're going to go to Leslie Perrigo first and then we're going to go to Mr. Timothy Tulon from, he's the Site VP, Vice President, Site Vice President at the Quad Cities Nuclear Power Station.

So, Leslie, would you like to come up here and talk to us please? Thank you.

MS. PERRIGO: Hello. I'm Leslie Perrigo. My organization is IECAN, as I said, Independent Environmental Conservation and Activist in that work. We work on energy reform and public issues, sort of like a much smaller version of Public Citizens.

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QC02-1 | There are a couple of concerns which I feel need to be addressed as they are legitimate concerns that relate directly to the health, safety and general well being of the environment surrounding the Quad Cities Nuclear Power Station. Regarding plant performance, failure to comply with the NRC procedures and complete basic routine maintenance on schedule has incurred preliminary wear and irreversible damage to vital reactor components increasing the possibility of a mechanical failure and the likelihood of a major accident.

| In June of 1996 a fine of \$100,000 was proposed against the utility for failing to correct design deficiencies for components in one of the plant's emergency core cooling systems. Modifications to pipe supports and structural steel in the 1980's had resulted in additional loads on steel beams. In some cases, exceeding those permitted in the original plant design. These deficiencies were not corrected until 1996.

| In June of 1997, a fine of \$50,000 was proposed for deferring repairs to the interior and exterior siting of the reactor building at Quad Cities Nuclear Power Station. Both interior and external siting are needed for the reactor building to fulfill its designed purpose, which is containment.

| In 1998, the NRC proposed fines in excess of \$450,000 for failure to implement an adequate program for monitoring maintenance, failure to develop adequate procedures and systems to safely shut down the Quad Cities Nuclear Power Station and for performing pressure tests of the interior reactor vessel in piping after the reactor had started up instead of before the reactor start up in order to detect any leaks in the reactor vessel and piping, which is the NRC regulation.

| Between June of 1999 and September of 2002, the utility neglected to correct multiple switch failures, which impacted the availability, reliability and capability of equipment used to respond to initiating events and prevent undesirable consequences from a plant fire. In March of 2003, the NRC staff identified a number of human performance issues, including damage to a control drive pump due to improper setting of a lubricating device, failure to recognize the unit to shut down cooling system was inoperable for several months and several instances of valves being placed in the wrong position.

QC02-2 | These are but a few of the events which have increased the amount of [undistressed] on the reactor components and accelerated the aging process. The NRC has confirmed that age-related degradation of boiling water reactors will damage or destroy vital internal components well before the standard 40-year license expires. Yet the readiness of the industry to meet the projected maintenance and repair challenges is unclear.

QC02-3 | For some components as in 1994, methodologies were still in the conceptual phase of development. The course route is one of many safety related components that may be damaged or destroyed by age related degradation and boiling water reactors. A German utility operating a General Electric Mark 1 boiling water reactor of the same design as Quad Cities 1

and 2 where extensive core shrouding was found estimated the cost of replacement at \$65 million. Germany's oldest boiling water reactor was closed in 1995 after German nuclear regulators rejected a plan to repair rather than replace the cracked core shroud. Extensive core shroud cracking was discovered at Quad Cities Unit 1 in 1994. Reactor aging will require a major continuous effort by the industry officials to anticipate emergent age related problems and resolve them before they become a crisis. By dealing with the whole problem of age related degradation now, Federal and State regulators can insure the safety and engineering implications of multiple failures in boiling water reactors.

2-4 Lastly, the continued operation of any General Electric Mark 1 boiling water reactor relies upon a nuclear waste storage and cooling pond that is elevated six to ten stories up in the reactor's secondary containment building and does not appear to have any significant structure to reduce the likelihood of penetration by deliberate attack. Only four of the 103 operating nuclear reactors in the United States have design features intended to resist aircraft impact.

Mark 1 and 2 and Seivert Reactors have design features that intend to resist aircraft impacts up to six times and Three Mile Island, Unit No. 1 was designed to resist aircraft impact up to 90 times. No other US reactor was designed to withstand aircraft impact.

2-5 The identified structural vulnerability of Mark 1 radiated fuel storage and cooling pond constitutes an unreviewed safety issue. Attack on a reactor could lead to rapid onset — with open containment and a raging fire. An NRC study concluded that a generic estimate of 100 percent of the radioactive isotope — 137 in the field pool would be released in the event of a spent fuel pool fire. A spent fuel pool contains, a full spent fuel pool contains 74 million curies of — 137.

2-6 Defense of nuclear facilities should be seen as a key component to Homeland Security. As such, spent fuel pools should be reequipped with low density racks and all other spent fuel should be hardened and dispersed throughout the site to make it a less attractive target.

2-7 In conclusion, I would just like to point out that the useful life time of a nuclear power plant is 25  
2-8 years in actual practice. This comes directly from something we found on the NRC web site. It is becoming abundantly clear that aging of reactor components poses serious economic and safety risk at boiling water reactors. The General Electric Mark 1, in particular, has significant inherent design flaws and lost containment integrity during nuclear accident.

2-9 Under the circumstances, it would be prudent to retire the Quad Cities Nuclear Power Station in 2012 and seek out safer more financial viable solutions for the community. Thank you.

MR. CAMERON: Thank you, Leslie. And, Leslie, do you want us to put a, we can attach the written version if you want to the record.

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MS. PERRIGO: Yes.

MR. CAMERON: Okay. Good, thank you very much, Leslie, for those comments. Let's go to Mr. Tulon to talk to use for a few minutes.

MR. TULON: Chip, thank you. I appreciate the opportunity to comment today. And I just want to thank Leslie for her comments because it's important within our environment that we have a very open commentary and debate on the issue.

But really what I want to comment on here in closing is the property tax issue because the property tax issue is a very difficult issue for both sides. Taking a look at a little background on the topic is the laws in the State of Illinois have changed. And they changed in 1997 to the year 2000.

And basically what happened is you changed the way the plant was assessed from going from essentially cost minus depreciation to what's termed the fair market value. And so here's the question, right? Is what is the fair market value of Quad Cities. We listened to Chairman Bohnsack talk about this offer and this value. It's a very difficult question to come around with.

And we have publicly stated in the past, and I am publicly stating here again today is that we intend to pay taxes and that the position of zero assessment for Quad Cities is really an extreme position. So I would tell you is we remain committed to solving this issue going forward. And we recognize the impact that this potentially has on local taxing bodies. And we are optimistic that we can reach agreement that's going to minimize the impact of the tax issue on Quad Cities.

Chip, I appreciate the opportunity to comment, thank you.

MR. CAMERON: All right. Thank you. Because we do have some time left, Duke had mentioned the open house and the opportunity to talk to the NRC staff. I just wanted to introduce some of the other NRC staff that are here from Headquarters and the Region in case any of you want to have any conversations with them after we formally conclude the meeting.

And you know the people who spoke. From Headquarters we have Jenny Davis right here who is on the Environmental Review Team, License Renewal. We have Laura Zaccari, who's from our Office of General Counsel. Headquarters, Mr. Rich Emch back there. And Rich is a Health Physicist. If you have health physics types of questions, please talk to him. And we're lucky to have a strong contingent here from our Regional Office.

And I first want to introduce the Resident Inspectors for Quad Cities. And these are the people who really are at the plant. They live in the community. They're looking to make sure the NRC regulations are met. And we have Carla Stoedter. Carla is the Senior Resident. And we have

Mike Kurth who is with us right here. And also Laura Kozak, who used to be a resident here and now she is the Lead Inspector in our Region 3 Office for license renewal. And we have Mark Ring here who's a Branch Chief within the Reactor Projects Division. And Theresa Ray, who's right over here from our Regional Office too.

And I didn't know whether, if Mark or any of you wanted to say anything about anything that you heard today. I'm not trying to put you on the spot but I just wanted to give you the opportunity if you wanted to say anything.

The staff is here and if you want to talk to them, please do so. And I just thank all of you for coming out and I'm going to turn it over to John. Do you want to say, John Tappert, say a few words to close the meeting out?

MR. TAPPERT: Just to thank everyone for coming out today. And notwithstanding Duke's caveats on the formal commenting process, if anyone wants to stay after the meeting and discuss any issues, we'll be happy to do that. And thanks again.

MR. CAMERON: We're adjourned.

### **Transcript of the Evening Public Meeting on December 16, 2003, Moline, Illinois**

MR. CAMERON: Good evening, everyone. And welcome to the NRC's public meeting tonight. My name is Chip Cameron. I'm the Special Counsel for Public Liaison at the Nuclear Regulatory Commission. And it's my pleasure to serve as your facilitator for the meeting tonight. And in that role I'll just try to make sure that all of you have a productive meeting.

And the topic tonight is the Draft Environmental Impact Statement that the NRC has prepared to assist it in its evaluation of the license application that we got for renewal of the Quad Cities operating license from the Exelon Company. Our format for the meeting is fairly simple. We're going to give you some background information. We have a number of presentations tonight on the NRC process and also on what the conclusions and findings and analysis are that are contained in the Draft Environmental Impact Statement.

We also want to hear from any of you who want to make a more formal comment on the record for us tonight on any of the issues in the Draft Environmental Impact Statement. And ground rules, if you have any questions or whatever, just signal me. I'll bring you this cordless microphone. Tell us who you are and your affiliation if appropriate. And we'll capture that on a transcript. Mr. Ron LeGrand is our stenographer tonight. That transcript of this meeting will be available, publicly available for anybody who wants to see it.

And the agenda is going to start out with Mr. John Tappert, who is the Chief of the Environmental Section in the Office of Nuclear Reactor Regulation back at NRC Headquarters

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in Rockville, Maryland. John's going to give you a formal welcome. And then we're going to move to Kimberley Corp, who's here, who is also with the NRC at NRC Headquarters in our Office of Nuclear Reactor Regulation. Kimberley is the backup Project Manager on the evaluation of the Quad Cities license renewal application, on the safety evaluation. And you'll be hearing there's an environmental evaluation. There's a safety evaluation to aid us in making a decision on whether to grant the renewal. And Kimberley will tell us about the overall license renewal process.

We're then going to focus in on the environmental review process. And we do have the project manager for the environmental review for the Quad Cities license renewal and that's Mr. Duke Wheeler. He's right here. Also, Office of Nuclear Reactor Regulation. Then we'll go on to you to see if there are any questions about the license renewal process.

And then we're going to get into some substantive conclusions. We're going to have Mr. Bruce McDowell, who's right over here. And Bruce is the team leader for the group of experts that the NRC has helping us to prepare the Draft Environmental Impact Statement. Bruce is from Lawrence Livermore National Lab in California. And he leads the team of experts from labs around the country who have been looking at the environmental impact. He's going to tell you what's in the Draft Environmental Impact Statement. He's going to do a summary of that for you.

We have a short subject, so to speak, something called Severe Accident Mitigation Alternatives. That's part of the Environmental Impact Statement and Bob Palla from the NRC staff, again Office of Nuclear Reactor Regulation, is going to lead us through that. And then we'll go for questions. And then we'll go to those who might want to make a formal comment. And if you decide to make a formal comment, just let me know. We've asked people to sign up in advance but we don't have a big crowd, so if the moment seizes you during the meeting, just let us know.

And thank you for being here tonight and we'll try to do our best to answer your questions. And we definitely want to listen to your comments. And I'm going to ask John to start us up.

MR. TAPPERT: Thank you, Chip. And good evening and welcome. And for those of you back from this afternoon, welcome back. My name is John Tappert and on behalf of the Nuclear Regulatory Commission I'd like to thank everyone for coming out tonight and participating in this process. I hope that you'll find the information we will share with you tonight to be useful and we look forward to receiving your comments tonight and in the future.

I'd like to start off by briefly going over the agenda and the purposes of tonight's meeting. First of all, we're going to provide a brief overview of the entire license for renewal process. This includes both a safety review as well as the environmental review, which will be the principle focus of tonight's meeting. Then we're going to present the preliminary findings of our



environmental review, which assesses the impacts associated with extending the operating licenses, the Quad Cities Units 1 and 2, for an additional 20 years. Then we'll give you some information about the schedule for the balance of our review and how you can submit comments in the future. And then finally, really the most important part of tonight's meeting where we receive any comments that you may have tonight.

But first let me provide some general context for the license renewal process. The Atomic Energy Act gives the NRC the authority to issue operating licenses to commercial nuclear power plants for a period of 40 years. For the Quad Cities units, those licenses will expire in 2012. And our regulations also make provisions for extending those operating licenses for an additional 20 years. And Exelon has requested license renewal for both units.

As part of the NRC's review of that license renewal application, we do an environmental review to look at the impacts on the environment for 20 years of extended operation. And we held a meeting here last April to seek your input early in our review and now we've returned, as we indicated at that earlier scoping meeting, to present the preliminary results in our Draft Environmental Impact Statement. And again, the real reason we're here tonight is to receive any comments that you may have on that draft.

And with that brief introduction, I'd like to ask Kimberley to give us more information on the safety review.

MS. CORP: Thank you, John. As Chip said, my name is Kimberley Corp and I'm the NRC's Backup Project Manager supporting the safety review of the Exelon's license renewal application for both Quad Cities in Dresden. Before I get into the discussion of the license renewal process, I'd like to take a minute to talk about the Nuclear Regulatory Commission in terms of what we do and what our mission is.

As John said earlier, the Atomic Energy Act of 1954 is the legislation that authorizes the NRC to regulate the civilian use of nuclear materials. In carrying out that authority, the NRC's mission is threefold. One is to insure adequate protection of public health and safety, two is to protect the environment, and three is to provide for common defense and security.

The NRC accomplishes its mission through a combination of regulatory programs and processes such as inspections, enforcement actions, assessment of licensee performance and evaluation of operating experience of nuclear plants across the country. The NRC's license renewal review is similar to the original licensing process in that it involves two parts.

The safety review, which includes a safety evaluation, plant inspections and independent review by the ACRS or Advisory Committee on Reactor Safeguards, as well as an environmental review, which Duke will discuss later. First you might ask what does the safety review

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consider? There are two types of safety issues, current operating issues which are dealt with now and aging management issues that are dealt with in license renewal.

Under the current operating license, the NRC's regulatory oversight deals with current safety issues. We do not wait for a plant to come in for license renewal before requiring them to address any issue. Because the NRC has or is dealing with those issues such as security or emergency planning, we do not re-evaluate them in license renewal.

The license renewal safety review focuses on aging management issues and the programs that the licensee has already implemented or will implement to maintain the equipment safely. The safety evaluation report is independently reviewed by the ACRS. The ACRS is a group of nationally recognized technical experts in the nuclear safety area that serve as a consulting body to the Commission itself. They review each license renewal application as well as the Staff's Safety Evaluation Report and form their own conclusions and recommendations and report them directly to the Commission.

The environmental review evaluates the impact of license renewal on a number of areas. These areas include, among others, ecology, hydrology, cultural resources and socioeconomic issues. As I said earlier, Duke will discuss the environmental review in greater detail next.

The next slide will discuss the license renewal process. You might ask, how does all this come together? This slide really gives a big picture overview of the license renewal process. And as you can see from this slide, the process involves two parallel paths; the safety review and the environmental review.

The safety review involves the NRC staff review and assessment of the technical information that's contained in the licensee's application. There's a team of about 30 NRC technical reviewers and contractors back at the NRC Headquarters in D.C. who are conducting the safety review right now. And the team is also supported by the technical experts at three different national laboratories including Argonne, outside of Chicago, Brookhaven in Long Island New York and Pacific Northwest in Washington State. So there's a lot of expertise in the team conducting this review.

The staff safety review focuses on the effectiveness of the proposed aging management programs for these plants systems, structures and components that are within the scope of license renewal. The NRC staff reviews the effectiveness of these programs to insure that the plant safety can be maintained throughout the license renewal term.

The safety review also focuses on the application's time limited aging analysis. Each original design analysis that had assumed a 40-year life must be reevaluated to extend the 40-year term to a sixty year life term for license renewal. This safety review process also involves audits and on site inspections. These inspections have been conducted by a team of

inspectors pulled together from both Headquarters as well as the NRC's Regional Office in Chicago.

The results of their inspections were documented in separate inspection reports. And the results of the staff's safety review as well as the results of inspections will be documented in the Safety Evaluation Report. And a copy of that will be provided to the ACRS for independent evaluation. Both the regional scoping and aging management review inspections have been completed. And we are in the process of writing the Safety Evaluation Report right now.

The second part of the review process involves an environmental review with scoping activities and developing a draft supplement to the GEIS, or Generic Environmental Impact Statement, for license renewal of nuclear plants. And this has been published for comment. And eventually we'll be issuing a final supplement to the GEIS for license renewal of nuclear plants which will address the comments that we receive here today at this meeting or in the future from any written comments.

So, as you can see from the slide, the final agency decision on whether to approve or deny the application will require a number of things. A Safety Evaluation Report, which documents the results of the safety review; the final supplement of the Generic Environmental Impact Statement, which documents the results of the environmental review as well as inspection reports that documents the results from the Regional inspections. All three of these reports will be factored in as well as the independent review of the ACRS into the final agency decision.

And that concludes the license renewal process.

**MR. WHEELER:** Good evening. I'm Duke Wheeler and I'm the Environmental Project Manager responsible for the environmental review that's being performed to support the license renewal application for Exelon for license renewal of Quad Cities Units 1 and 2.

The National Environmental Policy Act of 1969 requires a systematic approach in evaluating the impacts of proposed major Federal actions. Consideration is to be given to environmental impacts of the proposed action and mitigation for any impacts believed to be significant. Alternatives to the proposed action including taking no action on the applicant's request are also to be considered. Our environmental impact statement is a disclosure tool and it does involve public participation. The NRC regulations require that an environmental impact statement be prepared for license renewals.

Our decision standard, stated perhaps a bit more simply than what you read on this slide, is basically, are environmental impacts of the proposed action great enough that maintaining the license renewal option for Quad Cities Units 1 and 2 is unreasonable. And I'd like to point out at this time that we, the NRC, do not decide whether or not Quad Cities will operate for an

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additional 20 years. Other regulatory agencies and the licensee will actually make that decision.

Now, this slide is just an expansion of that bottom that you saw on Kimberley's, I think it's Slide 5 that you have, the bottom line was the path for the environmental review. This is an expansion of that. And basically where we stand in the process, the applicant did submit their application back in January the 3rd of this year through the *Federal Register* and other avenues. We publicized our intent to prepare an environmental impact statement.

One of the early phases of our process that's laid out by the National Environmental Policy Act was referred to as the scoping process. And there is an opportunity there for public participation. And basically the scoping process is, it's an activity whereby we receive comments from interested members of the public that help us to scope out the bonds of the environmental review for the various disciplines that we're going to be performing.

We also had a site audit. A team of environmental experts came out and visited the site in March. And also we had a public meeting in April, as John mentioned a bit earlier, another opportunity for public participation. And that was just a part of the scoping process.

After the site audit, if it's determined that we still don't have enough information for us to prepare our environmental impact statement, then we will send a formal request for additional information out to the licensee. We did that. They responded. We now have all the information we need. And we then published a draft of our environmental impact statement. And some of the alphabet soup here is GEIS. This is a Generic Environmental Impact Statement that we published several years ago. And it addressed, it gave common conclusions related to a lot of different environmental issues for license renewal of power plants across the country.

As each plant comes in for license renewal, we will publish a plant specific supplement to that Generic Environmental Impact Statement. And what I have published here in November is the supplement for Quad Cities Units 1 and 2. That's Supplement 16. And this meeting here is an opportunity for the public to provide us their comments on that Draft Environmental Impact Statement.

Once we get comments in from the public, and we'll go back, and because it's a draft, we'll take a look at it ourselves to see if there's any parts of it that need to be tweaked to be put into final form. And then July of 2004 we're going to be on schedule to publish our final environmental impact statement.

And I'd like to conclude my comments at the moment at this portion of it, turn the meeting back over to Chip. And then I'll be followed by our team leader, Bruce McDowell, who will get right into the real substance of what our environmental findings are. Chip?

**MR. CAMERON:** Okay, thanks, Duke. And before we get into the substance, let's see if there's any questions about the NRC process or about the NRC itself. Kimberley gave us a little bit of information on what our responsibilities are. And if you can just give us your name and affiliation, if appropriate.

**MS. REGAN:** Hi, my name is Molly Regan, and I'm with ICAN. And you made a comment, Duke, that other agencies and Exelon would be the ones that would determine whether this license is renewed or not.

**MR. WHEELER:** Right.

**MS. REGAN:** So does that mean that the NRC does not determine —

**MR. WHEELER:** Right, we do not.

**MS. REGAN:** What agencies then —

**MR. WHEELER:** State regulators have a say in whether or not the plant will operate and under what conditions.

**MS. REGAN:** But what other Federal agencies are involved in the final determination of issuing a license?

**MR. CAMERON:** I think that one thing we need to make clear here is that Duke didn't say that other agencies were involved in the decision to renew the license but whether to continue operating. In other words, the company needs an approval from the NRC in order to operate. But it's the company's business decision about whether they actually will operate and the State agencies who have an influence on whether the company will operate and at what rates. What agency is that, Duke?

**MR. WHEELER:** I would have to defer to the licensee, excuse me. If you're asking which State agency is the one that determines whether or not they can or cannot operate?

**MR. CAMERON:** Well, when you were referring to the statement that Molly was asking about and you said that other agencies and the licensee would be involved in whether the plant actually would operate.

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MR. WHEELER: My real message was although we issue the license to operate we are not the ones who make the actual decision as to whether or not they really do operate. It's our license that they must have in order to operate. But it's not our decision as to whether or not they actually will operate. That decision is a very large part up to, among others, the licensee.

MR. CAMERON: Is that clear, Molly? It's a distinction perhaps between the safety aspects of operation and the business economic aspects of operation. Do you want us to go further?

MS. REGAN: So is it the State where it's located? So it's just Illinois that has a determination in this? It's not any of — it wouldn't be like Iowa agencies would have anything to do with that?

MR. WHEELER: I would ask if there is a representative from Exelon here that can shed some light on who you have to deal with in order to get all the permissions you need to operate the plant. Can anybody —

MR. CAMERON: Fred, do you want to take a shot at this or?

MR. STORMER: Molly, to answer your question, I think the question that you're asking — I'm Bill Stormer, Site Communicator from Exelon Nuclear. I want to clarify your question. I think the question that you're asking, Molly, is who makes the decision whether to renew the license or not, who gives us the final permission as Exelon to operate the plant. Is that the question you're asking?

MR. CAMERON: You're going back to the NRC statement again.

MS. REGAN: Maybe I should read what I wrote down when Duke was speaking. Other agencies and Exelon will determine whether or not Quad Cities 1 and 2 will have their license renewed. And my question was what other agencies?

MR. CAMERON: Duke, and just to make sure that we know what you were saying, did you say that other agencies would make the decision about whether the license was renewed or —

MR. WHEELER: No.

MR. CAMERON: — they would operate. Okay. First of all, —

MR. WHEELER: Right. The decision on whether or not to renew the license is an NRC decision. Does that clarify anything?

MR. CAMERON: That's one thing.

**MR. WHEELER:** Once the renewed license then is issued, it's up to the utility and other regulators to decide what they want to do with what that renewed license will allow.

**MR. CAMERON:** John, do you want to try to shed some light on this for us?

**MR. TAPPERT:** Yeah, I don't know if I can or not but the point we're trying to make with that, the NRC is the sole regulatory authority for issuing the license, okay? So we're going to make the determination some time late next year whether to extend their license for another 20 years or not. The distinction that we're trying to make in the presentation is just because we extend that license to 2032, they may or may not operate during that period of time. They have a license to operate. You may have a license to drive. You may chose not to drive for any number of reasons. You don't have a car. You don't have, you know. They may decide for economic reasons it's not appropriate to continue to operate the facility but they have a license.

That's not to say that the NRC just issues a license and then walks away. There's a continuing and ongoing oversight process to make sure that if they do operate they will operate safely. I'm not sure if that helps at all but that was the point we were trying to make there.

**MR. CAMERON:** Okay. Thanks, Molly, for at least allowing us to try to clarify what we were talking about there.

How about other questions? Anything on process or the NRC before we go on to the findings? And if something comes up during the meeting, a question, we'll deal with it then.

Duke, thank you and Kimberley and John.

And now we're going to go to Bruce McDowell who's going to talk about the findings in the Draft Environmental Impact Statement.

**MR. MCDOWELL:** Good evening, I'm Bruce McDowell from the Lawrence Livermore Laboratory and I am the team leader for the team of experts that prepared the Supplemental Environmental Impact Statement for Quad Cities license renewal.

In the Generic Environmental Impact Statement for license renewal, the NRC identifies 92 environmental issues that are evaluated for license renewal. Sixty-nine of these issues are considered generic or Category 1, which means that the impacts are the same for all reactors or the same for all reactors with certain features such as plants that use water from large rivers.

For the other 23 issues, referred to as Category 2, the NRC found that the impacts were not the same at all sites and therefore a site specific analysis was needed. Only certain issues addressed in the Generic Environmental Impact Statement are applicable to the Quad Cities

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plant. For those generic issues that are applicable to Quad Cities, we assessed if there was any new information related to the issue that might change the conclusion in the Generic Environmental Impact Statement. If there is no new information then the conclusions of the Generic Environmental Impact Statement are adopted.

If new information is identified and determined to be significant, then a site specific analysis would be performed. For site specific issues related to Quad Cities, site specific analyses were performed. Finally, during the scoping period, the public was invited to provide information on potential new issues. And the team, during their review, looked to see if there were any new issues that needed evaluation.

For each issue identified in the Generic Environmental Impact Statement, which I'm going to call the GEIS, an impact level is assigned. These impact levels are consistent with the Counsel on Environmental Quality. For a small impact the effect is not detectable or too small to de-stabilize or noticeably alter any important attribute of the resource. For example, the plant may cause loss of adult and juvenile fish at the intake structure. If the loss of fish is so small that it cannot be detected in relation to the total population in the river, the impact would be small.

For a moderate impact the effect is sufficient to alter noticeably but not de-stabilize the important attributes of the resource. Using the fish example again, if losses of intake cause the population to decline and then stabilize at a lower level, the impact would be moderate. And finally for an impact to be considered large, the effect must be clearly noticeable and sufficient to de-stabilize important attributes of the resource. So if losses at the intake cause fish population to decline to the point where it cannot be stabilized and continually declines, then the impact would be large.

As Kim said earlier, there's a team with a broad expertise that wrote this supplemental environmental impact statement. And these are some of the areas, these are the areas that we addressed in our analysis. The staff has considered information from a broad range of sources during the development of this supplemental EIS. We have considered the licensee's evaluation of environmental impacts that was submitted with the license application.

We have conducted a site audit during which the staff visited the plant and interviewed staff personnel. We talked to Federal, State and local officials as well as local service agencies. In addition, we have also considered all the comments received from the public during the scoping period. These comments are listed in Appendix A along with the NRC responses. The information received from all these sources is the basis for the analysis and a preliminary conclusions in the draft EIS that you have in front of you.

In Chapter 2 of the draft supplemental EIS, we discuss the plant and the environment around the plant. In Chapter 4 we looked at the potential environmental impacts for an additional



20 years of operation for the Quad Cities nuclear station. The team looked at issues related to the cooling system, transmission lines, radiological impacts, socioeconomic impacts, ground water use and quality and threatened and endangered species. Each of these issues are discussed in detail in the draft supplemental EIS. I'll take just a few minutes to identify the highlights of our review.

One of the issues we looked closely at is the cooling system for the Quad Cities plant. This is the layout of the cooling intake and discharge canals. Although there are a number of Category 1 issues related to the cooling system, and remember that we said the Category 1 issues are those that have been determined to have the same significance for all plants. No new and significant information was identified during scoping by the applicant or the staff during the review of the issues.

The issues that the team looked at on a site specific basis include entrainment and impingement of fish and shellfish, heat shock and enhancement of microbiological organisms. Potential impacts in these areas were determined to be small and additional mitigation is not warranted.

Radiological impacts are a Category 1 issue. As you recall, this means that NRC has made a generic determination that the impacts resulting from radiological releases during nuclear plant operations are small. But because it is often a concern of the public I wanted to take a minute to briefly discuss it. During the site visit we looked at the effluent release and monitoring program documentation. We looked at how the gases and liquid effluents were treated and released as well as how the solid waste were treated, packaged and shipped. This information is found in Chapter 2 of the Draft Supplemental EIS.

We also looked at how the applicant determines and demonstrates that they are in compliance with regulations for a release of radiological effluence. The licensee monitors the near site and on site locations for airborne releases and direct radiation. There are other monitoring stations beyond the site boundary including locations where water, milk, fish and food products are sampled. Releases from the plant and the resulting off site potential doses are not expected to increase on a year to year basis during the 20-year license renewal period.

No new and significant information was identified during the staff's review. The public's input during the scoping process or other evaluation or the evaluation of other available information.

The generic EIS determines that the impacts of the 69 Category 1 issues were small based upon the information known at that time. As part of my team's review we looked at all information collected during the scoping process to identify any information that was both new and significant with regard to any one of these 69 issues.

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We looked at the information developed by the licensee, information developed independently by my team and information received during the public comment process. We determined that none of the information was both new and significant. Therefore, the conclusions of the generic EIS are adopted in this draft supplemental EIS.

The last issue from Chapter 4 I'd like to discuss is that of threatened and endangered species. The only Federally listed aquatic species that currently occurs in the vicinity of the Quad Cities plant is the Higgins eye pearly mussel. The essential habitat for this species is located about one mile downstream from the site.

There are a number of terrestrial species listed as threatened or endangered that could occur in the range of the Quad Cities site and transmission lines. These include the bald eagle, Indiana bat, the river otter, the Iowa pleistocene snail and the western hognose snake. During winter migration, bald eagles visit open water in the Mississippi River caused by the plant's thermal discharges. They also use the area for summer nesting and there is a known nest about eight miles north of the site.

The Indiana bat, river otter, Iowa pleistocene snail and western hognose snake could occur in the counties where the plant and the transmission line are located. Since the licensee does not plan any refurbishment or construction activities as part of relicensing, the natural area where these species would be found would not be disturbed. This would also be true for the three threatened plant species; the eastern and western prairie fringe orchid and the prairie bush clover.

Therefore, the staff's preliminary determination is that the impact of the operation on the Quad Cities plant during the license renewal period on threatened and endangered species would be small.

The staff also considered cumulative impacts. These are impacts that are minor when considered individually but significant when considered with other past, present or reasonably foreseeable future actions regardless of what agency or person undertakes the other actions. The staff considered cumulative impacts resulting from operation of the cooling system, operation of transmission lines, releases of radiation and radiological materials, sociological impacts, ground water use and quality impacts and threatened and endangered species impacts.

These impacts were evaluated to the end of the 20-year license term, license renewal term. The geographical boundary of the analysis was dependent upon the resource. For instance, the area analyzed for transmission lines was of course different than the area analyzed with the cooling water system. The staff's preliminary conclusion is that any cumulative impacts

resulting from the operation of the Quad Cities plant during the license renewal period would be small.

The team also looked at the uranium fuel cycle and solid waste management and decommissioning. All issues for uranium fuel cycle and solid waste management as well as decommissioning are considered Category 1. And for these issues, no new and significant information was identified and we therefore adopted the conclusions of the Generic Environmental Impact Statement.

Our team evaluated the potential environmental impact associated with the Quad Cities plant not continuing operation and replacing this generation with alternative power sources. In 2001, Quad Cities Units 1 and 2 generated 13 billion kilowatt hours of electricity. The team looked at no action alternatives, — action alternative, new generation from coal-fired, gas-fired and new nuclear, purchased power, alternative technologies such as wind, solar and hydro power and then a combination of alternatives.

For each alternative we looked at the same types of issues. For example, water use, land use, ecology and socioeconomics that we looked at for the operation of Quad Cities during the license renewal term. For two alternatives, solar and wind, I'd like to describe the scale of the alternatives that we considered because scale is important in understanding our conclusions.

First solar. Based on the average solar energy available in Illinois and the current conversion efficiencies of photovoltaic panels, these cells would produce about 100 kilowatt hours per square meter per year. As such, about 120 million square meters or about 46 square miles of cells would be required to replace the generation from the Quad Cities plant.

Regarding wind power, wind turbines have capacity factors of between 30 and 35 percent. As such, at least 4,200 megawatts of wind power would have to be developed to replace Quad Cities' 1800 megawatts. To put this in context, in 2002, total wind power capacity in the United States was 4,500 megawatts. In other words, the total wind power in the United States would have to double to replace the generation of the Quad Cities.

Due to these scale issues and other siting requirements of reasonable alternatives, the team's preliminary conclusion is that the environmental impacts of alternatives, at least in some impact categories, reach moderate or large significance.

So to review; in their Generic Environmental Impact Statement, NRC examined environmental issues at all sites and found that the same conclusion could be made for 69 Category 1 issues. In our analysis we found no information that was new and significant and we adopted the GEIS conclusions. We also performed site specific analysis for Category 2 issues applicable to Quad Cities. And lastly, we found no new impacts that were not discussed in the GEIS.

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To summarize our findings; for the 69 Category 1 issues presented in the GEIS, again we found no information that was new and significant. Our team analyzed the remaining issues in the supplemental EIS and we found the environmental effects resulting from these issues were also a small significance with one exception. On one segment of the transmission line the induced currents were calculated to be six miliamps. Since this slightly exceeds the national, the NESC standard of 5 miliamps, we judge the impact to be a moderate significance. Since this line is not owned by the licensee, NRC has notified the owner of its findings.

Lastly, we found that the environmental impacts of alternatives, at least in some impact categories, reached moderate or low significance.

Now, I turn it back to Chip, see if there's any questions.

MR. CAMERON: Okay, thanks, Bruce. Bruce talked about the number of different categories of environmental impacts that the NRC looked at, including alternatives. Are there any questions about some of the potential impacts, findings of the Draft Environmental Impact Statement?

Yes, sir. And if you can just give us your name, please.

MR. BROWN: My name is Bennett Brown. I'd like to know more about how the directory expense system of this plant in particular was considered in the plant's specific environmental impact statement.

MR. MCDOWELL: The which?

MR. CAMERON: Can you just state that again for us?

MR. BROWN: The Quad Cities plants both are Mark 1 Reactors from General Electric. And their containment system, that the primary containment, is a concrete shell designed to contain the reactor under high pressure. The secondary containment is a one million gallon donut shaped tank of water under ground. And in the '70's, after five years of operation, these reactors were identified as having been designed incorrectly. The tank was recognized as being under sized and a recommendation was made by the NRC that modifications needed to be made to all of those 18 plants because there was a 90 percent likelihood that if called upon in the event of an accident that that secondary containment system would fail, the 90 percent likelihood that it would fail.

To address that problem the Mark 1 owners, the collaboration of companies that own Mark 1 reactors from General Electric, came up with a solution which was approved by the NRC as a patch work fix to the design of these plants to bypass containment in the event of an accident

by connecting the torus, the donut shape tank of water, to the stack so that if the pressure in the cooling, the secondary cooling tank in the torus builds up above 30 PSI, the reactor operates under several hundreds of PSI, I believe. If the pressure in that donut shaped tank rises above 30 PSI, then a plug is blown and butterfly valve at the option of plant control operators can be opened to the stack. And then the emissions are released to the atmosphere directly bypassing the containment.

I'm wondering how that modification, my question then is how is that modification to the original plant taken into consideration in your analysis of the risk of radioactive release to the public?

MR. CAMERON: Okay, and thank you, Bennett. And I think there's at least two parts to this and we're going to go to Bob Palla. But the first part, Bob, is to comment on Bennett's characterization of the issue. And I think the second part is is that an issue that the NRC deals with under the normal operating regulation framework or is it something that would be looked at in terms of license renewal either in the safety evaluation or the environmental impact statement.

MR. PALLA: Yes, let me explain. And it's a fairly accurate characterization of what this system is. It may be called a Torus Vent system. And it's true that the owners group at NRC's urging, all of the Mark 1 plants with maybe some exceptions on — there may be an exception with an isolation Mark 1 plants. But they implemented a venting system that would allow the Torus pressure to be relieved in certain events. And by relieving the pressure, in essence you have a controlled release and you avoid a catastrophic rupture of the containment, the primary containment or the torus itself.

The types of sequences that this vent was intended to address are beyond design basis. These involve multiple failures of the containment heat removal system. And the scenario that typically forms a basis for this plant improvement is a scenario in which the containment heat removal is completely lost and for an extended period of time. And I'm talking on the order of a day. It could be 24, 36 hours.

The reactor scrams. There's no heat removal from the torus where the heat would normally be drawn from and put the heat exchangers in release. So over time the water in the torus would heat up, boil, create a bunch of steam and then gradually over pressurize the containment unless it was vented. And all this time the core is still being kept cool. Water's being injected to the core. But it's being steamed into the containment and the pressure's increasing. So this vent system was installed to allow the containment to be vented without a loss of the containment function.

And if you lost the containment and if you lost the torus, you could drain the water out of the torus and lose, this is the water you want to have so you can inject it to the core. So, this is,

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again, it's beyond design basis accident. It's picked up typically in a probabilistic risk assessment study, you would look at that class of accidents.

Before the vent was installed, these accidents would go out to about 24 hours or so, leave the containment failure. The core is cooled at that time but then, as a result of the containment failure, you'd lose injection to the core and then you'd have a core melt. So, you know, at about a day, you know, a little after a day.

With this vent system installed, again, you're going to have to lose containment heat removal for over a day before you get into the situation. But with the vent, you'd vent the containment and conceivably would just keep injecting until eventually you would recover containment to your removal and you would not melt the core. You would just vent the containment. It's a clean release, so to speak. Core melt hasn't occurred yet.

MR. CAMERON: And this venting system, is this something that's dealt within the license renewal aging analysis, I guess is the next question or the environment impact statement.

MR. PALLA: It's not really an issue for, it's not an aging related issue. It's a facet of the design now that has been implemented, taking into account risk considerations and severe accident analysis. So, it's in essence a system that would prevent an accident from going to core damage as a result of containment failure. That's why that system was put in place.

MR. CAMERON: Okay, so, Bennett, I think that the answer to the question is, from what I understand —

MR. PALLA: That was a short answer.

MR. CAMERON: — it won't be dealt with in the License Renewal Aging Program or the Environmental Impact Statement. And perhaps, Bob, —

MR. PALLA: Let me just suggest how is it — it's not part of anything done in any of the environmental review other than if you've looked at just the severe accident mitigation alternative write up in Chapter 5, or back in the Appendix G, we look at the risk profile for the plan. And the risk profile would include — it has a, every plan has a risk profile, which is in essence a number of unique ways that you can end up with core damage and releases to the environment. And each one of those is assigned a frequency of occurrence and a source term, the quantities of fission products that would be released.

And there is a class of accidents that involve this loss of containment heat removal that would be identified. There would be a certain frequency assigned and a source term would be

assigned to that that would correspond to the release as it would occur. So there is a source term and a frequency assigned. And this is one of the components of the risk profile.

That's the starting point for the SAMA analysis. We look at that risk profile and then say, is there some way we can identify a further way to reduce the risk?

MR. CAMERON: You're going to talk about not this particular problem, necessarily, or issue but you're going to talk about the SAMA program in the next presentation. And Bennett, let me ask you if you have a follow up.

MR. BROWN: I had several questions, I guess, that arise as a result of this. But before proceeding I'd like to ask a procedural question. Are my questions in this section recorded in the comment section that will be appended to the SEIS?

MR. CAMERON: This is, this is on the record. And the transcript will show this. Often during the question and answer period someone will ask a question that implies a comment about something that we should look at. When that does happen, we treat that as a comment. We look at that issue. So, in other words, it doesn't have to be made formally characterized as a comment.

Is that the question you're asking?

MR. WHEELER: I think, Bennett, possibly before you came in, it was pointed out this meeting is being transcribed. We have a transcriber that's getting all this down. And I'll get a copy of the transcripts. And first of all, I'll put those transcripts in the public record. But then in preparing the final Environmental Impact Statement that will be issued in July, all of these comments will appear in Appendix A of that final.

To the extent that it is practical, I will just block feed right out of the transcript into the Environmental Impact Statement. If it gets so long of a project that the document becomes unwieldy, then I reserve the right to summarize at least somewhat. But the substantial substance of what is being said here will go into the final Environmental Impact Statement at Appendix A.

MR. CAMERON: Whether it's offered during the formal comment part of the meeting or was offered during the question and answer, right?

MR. WHEELER: Oh, absolutely, yes. Or any one of other ways that I'll get into a little later.

MR. CAMERON: I think that's what the concern is.

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Do you want to ask — okay, go ahead, Bennett.

**MR. BROWN:** I'm grateful for your time here and I don't want to take too much of it but it's an issue that's important to me and I think it's a critical question concerning this particular reactor. So if you'll bear with me and dwell on the question for a moment. I'm grateful for your help over the last several months in understanding the process related to this particular plant.

I have several questions that were raised by your explanation. One is that, you mentioned that it's a gradual build up of heat. And as I understand the calculations, an 800 megawatt plant, if it fails to scram for any reason, if there were any failure to stop the reaction, and I'm not talking about a super critical event. I'm simply talking about for one reason or another the plant needs to scram, for instance, the grid were to fail and the plant has nowhere to deliver that power and therefore needs to shut down the power so that the heat that is being generated will not boil the cooling water. So the plant needs to scram.

If that scram were to fail, how many seconds will it take before the heat storage available in the torus, in this million gallon tank, is exhausted before the million gallons of water boils? And as a physicist it's a back of the envelope calculation. A million gallons of water is, you know, four times that gets you liters, which is kilograms. You multiply it by a thousand to get grams and you multiply it by four to get joules. And I think it's five minutes.

So I think in the event of a failure to scram, five minutes from that point, once blow down begins, once the process of blowing pressurized reactor steam into the torus begins, it would be five minutes before that torus boils. At that point pressures would rise very rapidly. I'm sure you'd agree and it would be a matter of seconds before the direct torus vent system, the system that directly vents the torus to the atmosphere would need to be deployed. So I wanted to clarify your characterization of gradual.

**MR. CAMERON:** Okay, let me, before you do that, Bob, I know that for at least some of us in the room that we are using technical terms like scram and things like that that people probably, some people, some of us don't understand exactly what that means. And, Bob, this is an important issue and to answer the question. And maybe if we do have one more follow up from you, Bennett, you can, you know, bring us back up to, you know, 50,000 feet sort of and tell us what the implications are of what you're saying so that everybody understands that. Bob?

**MR. PALLA:** Now, the type of accident that you're referring to, we call it an anticipated transient without scram. And that could occur to varying degrees. It could be a complete loss or it could be a partial loss of shut down. So if you completely lost the shut down function, you would be dumping a large quantity of heat into a pool that can only take so much. So it would be a matter of — I'm not sure that it would be five minutes or whether it would be, you know, an hour. But it would be a relatively short term event.



Now, let me go back to, I guess, just to put this kind of an accident in the right kind of box, this is, again, an accident that involves the failure of multiple safety systems, systems that were put there deliberately to prevent that kind of an accident. And that was rule that mandated certain things be done to address that kind of event because it would be a challenge to the containment integrity. And it would be a challenge to the integrity with or without this torus vent. The torus vent is not large enough to, in and of itself, relieve the pressure and have everything just maintained at an adequately low pressure. Even if the torus vent actuates, you're still going to over pressurize the containment in this scenario. And so I don't think it really affects the, ultimately. It'll have some influence but it won't have a radical impact on what happens in that event. If it's a complete loss of shut down, you're going to basically pump the containment up with steam and not be able to control the pressure in the containment with or without that vent. You'd have to have a vent that it would probably be about three foot in diameter to deal with the K heat levels that I think you'd have in that accident.

MR. CAMERON: Thanks, Bob. And let me ask John to try to put all of this and Bennett's questions and concerns in a context.

MR. TAPPERT: Yes, I just want to bring it back to what your original question was, was the vent considered in the environmental review and things of that nature. And the answer is, yes. I mean, Bob's next presentation up here is going to be about severe accident mitigation charges. And he looks at these beyond design basis. These very rare but potentially high consequence events. So that as in the Chapter 5 analysis, in the review. And in the Generic Environmental Impact Statement, we also looked at severe accidents.

So, obviously Bob can go into bone crushing detail in all these scenarios. He'd be happy to do that with you after the meeting, if you'd like. But the short answer is these scenarios were, in fact, considered and Bob's next presentation's going to cover some of that.

MR. CAMERON: Okay. So, after Bob's presentation, if you have more questions on this, let's go to those at that point, okay?

MR. BROWN: Thank you.

MR. CAMERON: All right. Yes, madam, and could you just tell us your name, please?

MS. MONAHAN: Dorothy Monahan. I just had a question about how you determine fatigue value of the properties over the 20-year period. I know personally that 20 years can be very debilitating.

MR. CAMERON: Okay. I think that's an aging issue for perhaps Kimberley. And Kimberley, is the question clear to you?

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MS. CORP: Right, she's asking about the fatigue analysis. And they reevaluate all of those figures and the staff does an independent calculations of their own from the data that is from the plant. They use actual plant data to — they use Reg Guide 1.99 sets out the guidelines for their fatigue analysis. And the results of that will be in the Safety Evaluation Report, which will be, the draft will be published in March of next year. So, currently that's under review right now.

MR. CAMERON: So, if someone wanted to see more details on how we do the fatigue analysis, they could look, first of all, at this regulatory guide that we have —

MS. CORP: Right.

MR. CAMERON: — 1.99.

MS. CORP: Yes, that is correct. But it'll be specifically in Chapter 4 of the SER when it's published, the Time and Aging Analysis.

MR. CAMERON: Does that give you somewhat of an answer? I mean, we have documents and analysis that deal with it. But does that answer your question or can we provide some more?

MS. MONAHAN: Yes.

MR. CAMERON: All right. And we'll make sure that we talk to you after the meeting, too, to make sure that we have given you as much information on that as possible.

Anything else on the Draft Environmental Impact Statement at this point?

Okay. We're going to go to Bob — well, Bennett, do you have a question that's not going to be addressed in this presentation? In other words, you have another question on the Environmental Impact Statement?

MR. BROWN: Not having heard your presentation yet, I have no way of being able to say that obviously. But I wanted to ask a brief straightforward question so that you could be sure to include this information in your presentation. In considering alternatives and comparing the option to continue the license of this plant versus other power sources, I just want to know where the consideration of this design flaw is taken into consideration. So when you look at, for instance, building a new nuclear power plant that would not have this flaw, which is, I understand, it would be easy enough to build a new one that would not have this flaw from these early nuclear power plants. Just if you would, please, point out how the risk factor of an accident and the exposure levels to the public are reduced in that model versus the existing models.

**MR. PALLA:** You're probably have to come back to me with a more, you know — I probably won't hit that enough to satisfy you.

**MR. CAMERON:** Just let me ask a question of the staff before we go on there. In terms of Bruce's discussion, the discussion in the Draft Environmental Impact Statement on looking at alternative sources, I think at least we can answer the question of when you look at alternatives, for example, another nuclear plant, did you consider doing that analysis any specific design issues related to the nuclear plant or did you only, Bruce, look at — what did you look at when you look at an alternative for another nuclear plant?

**MR. MCDOWELL:** The alternatives, what our task was is to evaluate the environmental impacts of alternatives. We analyzed the environmental impacts of the operation of Quad Cities. We looked at the environmental impacts of the new nuclear plant, a coal-fired plant, a gas-fired plant and all the different range of alternative technologies. And we came to a conclusion on the environmental impacts of each one of those.

For probably part of the reasons that Bob is going to tell you about, the accident that you're considering I think is dealt with to the NRC satisfaction in the safety space and we didn't consider that specific thing you're thinking about to be an impact area. It was, it's a flaw that I think Bob can talk more about how it's being addressed.

So, I just leave that up to him.

**MR. PALLA:** Yes, I'll try to hit on that but we can talk some more if I don't.

Okay, you want to go to the next slide there?

My name is Bob Palla. I'm with the Probabilistic Safety Assessment Branch of NRC. And I'll be discussing the environmental impacts of postulated accidents. These impacts are described in Section 5 of the Generic Environmental Impact Statement or GEIS. The GEIS evaluates two classes of accidents; design basis accidents and severe accidents. The design basis accidents are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can safely respond to a broad spectrum of postulated accidents without risk to the public.

The environmental impacts of design basis accidents are evaluated during the initial licensing process and the ability of the plant to withstand these accidents has to be demonstrated before the plant's granted a license. Most importantly, a licensee's required to maintain an acceptable design and performance capability throughout the life of the plant, including any extended life operation.

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Since the licensee has to demonstrate acceptable plant performance for the design basis accidents throughout the life of the plant, the Commission has determined that the environmental impact of design basis accidents are of small significance. Neither the licensee nor the NRC is aware of any new and significant information on the capability of the Quad Cities plant to withstand design basis accidents. Therefore, the staff concludes there are no impacts related to design basis accidents beyond those discussed in the GEIS.

The second category of accidents evaluated in the GEIS are severe accidents. Severe accidents are, by definition, more severe than design basis accidents because they could result in substantial damage to the reactor core. The Commission found in the GEIS that the risk of severe accident in terms of atmospheric releases fall out onto bodies, open bodies of water and releases the ground water and societal impacts. These are all small for all plants.

Nevertheless, the Commission determined that alternatives to mitigate severe accidents must be considered for all plants that have not done so. We refer to these alternatives as severe accident mitigational alternatives or SAMA's, for short. The SAMA evaluation is a site specific assessment and is a Category 2 issue as explained earlier. The SAMA review for Quad Cities is summarized in Section 5.2 and described in detail in Appendix G of the GEIS supplement.

Now, the purpose of performing the SAMA evaluation is to insure that plant changes with the potential for improving severe accident safety performance are identified and evaluated. The scope of plant improvements that were considered include hardware modifications. And along that line of things like filter vents, which would be a similar type of vent for this hardened torus vent that we're talking about. But it would include an added filter. Large vents, larger sized vents that could accommodate anticipated transients without scram. These are the kinds of things, the hardware mods that we looked at.

Also looked at procedure changes, training program improvements as well as additional changes. Basically a full spectrum of potential changes. And the scope includes SAMA's that would prevent core damage as well as SAMA's that improve containment performance given that core damage event were to occur.

The SAMA evaluation process consists of a four step process. The first step is to characterize the overall plant risk and the leading contributors to risk. This typically involves the extensive use of the plant specific probabilistic risk assessment study or PRA. The PRA is a study that identifies different combinations of system failures and human errors that would be required for an accident to progress to either core damage or containment failure.

The second step in the process is to identify potential improvements that could further reduce risk. The information from the PRA, such as dominant accident sequences, is used to help identify plant improvements that would have the greatest impact in reducing risk.

Improvements identified in other NRC and industry studies, as well as SAMA analysis for other plants are also considered.

The third step in the evaluation is to quantify the risk reduction potential in the implementation costs for each improvement. The risk reduction and the implementation cost for each SAMA are typically estimated using a bounding analysis. The risk reduction's generally overestimated by assuming that the plant improvement is completely effective in eliminating the accident sequences it is intended to address. And the implementation costs are generally underestimated by neglecting certain cost factors such as maintenance costs and surveillance costs that would be associated with the improvement.

The risk reduction in the cost estimates are used in the final step to determine whether implementation of any of the improvements can be justified. In determining whether an improvement is justified, the NRC staff looks at three factors. The first is whether the improvement is cost beneficial. In other words, is the estimated benefit greater than the estimated implementation cost of the SAMA. The second factor is whether the improvement provides a significant reduction in total risk. For example, does it eliminate a sequence or a containment failure mode that contributes to a large fraction of plant risk. And the third factor is whether the risk reduction is associated with aging affects during the period of extended operation. In which case, if it was, we would consider implementation of the improvement as part of the license renewal process.

Preliminary results of the Quad Cities' SAMA evaluation are summarized on this slide. Two hundred eighty candidate improvements were identified for Quad Cities based on review of the plant specific PRA, relevant industry and NRC studies on severe accidents and SAMA analysis performed for other plants. Exelon reduced this set to a set of 15 potential SAMA's based on a multi-step screening process.

Factors considered during this screening included whether the SAMA is not applicable to Quad Cities due to design differences, would it involve major plant modifications that would clearly exceed the maximum obtainable benefit or would provide only a minimal risk reduction based on review of the PRA. A more detailed assessment of the conceptual design and costs was then performed for each of the 15 remaining SAMA's. This is described in detail in Appendix G of the GEIS supplement.

The cost benefit analysis shows that four of the 15 SAMA's are cost beneficial when evaluated in accordance with NRC guidance for performing regulatory analysis. All four cost beneficial SAMA's involve procedural improvements rather than hardware modifications.

As shown on the next slide, the cost beneficial SAMA's involve developing procedures to operate equipment locally following loss of 120 volt bus by using temporary connections to the

Appendix A

second unit. The second procedure involves, that would be developed involves procedures to manually control feedwater given the loss of a 120 volt DC control bus. 120 volt DC losses are important in the risk profile in this plant. That's why these improvements come to the top.

The third procedural enhancement involves developing procedures to terminate reactor depressurization prior to loss of the steam driven reactor injection pump so that core cooling can be maintained. And the fourth improvement involves developing procedures to control containment pressure during venting in order to assure adequate suction head for the pumps that are used for core injection.

So of these four, for all of the four, none of these four SAMA's are related to aging or managing the effects of plant aging. And therefore, none of them are required to be implemented as part of license renewal.

So, to summarize, the NRC staff's preliminary conclusion is that additional plant improvements to further mitigate severe accidents are not required at Quad Cities as part of license renewal. It's necessary for me to point out, however, that even though they're not required as part of license renewal, the staff intends to pursue these improvements further with Exelon under the current operating license.

So, I can take any additional questions.

MR. CAMERON: Okay, thanks, Bob. Bennett, with that perspective, do you want to ask some more questions about the particular design feature that you're talking about?

MR. BROWN: I think I understand how you, to what extent you included the directory expenses to —

MR. PALLA: There were some specific enhancements targeted in that area. These, when one looks at the cost estimates for doing hardware fixes like that, they're hugely expensive. When you look at the probability of the accidents that you're dealing with, and let's take these ATWS events, for example. Their frequency's quite low. Like ten to the minus eighth. In Appendix G there's a listing of dominant contributors and this one isn't labeled as well as it might have been. But in Table G1 on Page G3, Appendix G, manual shut down, initiating events/accident class is the heading and there's an entry Manual Shut Down. I believe this is a failure to manually shut down the reactor. It's something like basically ten to the minus seven events per year.

You have to account for the frequency in accessing what is the, you know, how much benefit are we going to derive from spending a certain amount of money. So, you've got a combination of an event that could, in fact, have a large consequence associated but it's probabalistically weighted. And then the costs are compared to that. And these are very expensive mods.

These are multi million dollar fixes. So that is one of the mods that would be screened out in the early phases of this process.

MR. CAMERON: Bob, I hate to, I hesitate to ask but is there any way that when you talk about a frequency of ten to the minus seven, can you give the people an idea of what that means?

MR. PALLA: One in ten million years.

MR. CAMERON: Okay, thank you.

Any other questions on this SAMA's or on Bruce's presentation on the other types of environmental impacts at this point?

Okay, well, Duke is going to give us a few words on how you submit comments. And then we're going to on to you for some more formal comments. Duke?

MR. WHEELER: Thank you. First of all, to summarize what our preliminary conclusions are in this Draft Environmental Impact Statement, first of all, the environmental impacts of license renewal is considered to be small for all impact areas with the one exception of the North Nelson Line that Bruce had pointed out where the induced current was 6 miliamps compared to the National Electric Safety Codes specification of 5 miliamps.

The impacts of alternatives to license renewal range anywhere from small to large and we end up with our preliminary recommendation is that the environmental impacts of license renewal for Quad Cities 1 and 2 are not so great that preserving the option of license renewal is unreasonable.

This slide just has a couple of key milestones in our schedule here that are related to the environmental review portion of our schedule. I did publish the Draft Environmental Impact Statement on November the 4th. We are now pretty much in the middle of our public comment period, which will expire on January the 27th of next year.

And by the way, one comment that I'd like to say is that I'm not going to slam the door shut the close of business on January the 27th. Anything that I do receive by that date I will include in the final environmental impact statement and the comment will be addressed in the final. If I do receive a comment after January the 27th, then I will try to address it.

But we get to a point where it becomes impractical because for me to publish by July, there's a certain time when I have to get the manuscript over to publication. And backing up from there, there's preparation of the manuscript. Getting it staffed through all the people that need to review it and concur in it. And after January the 27th, I'll just give it my best shot but can't make

## Appendix A

any promises. And yet the last item on the slide there is that we do have a schedule that does provide for issuance of the final environmental impact statement in July.

This slide just identifies myself as your primary point of contact with the NRC staff for matters related to the environmental impact statement and our environmental review. The slide also indicates where in the local community copies of our Environmental Impact Statement can be found. The Cordova District Library, the River Valley District Library and then also the Davenport Public Library. And after we mailed this out, I did get on the phone with all three libraries and did verify that they had received their copies of it so it's there if you want to take a look at it.

The last item on this slide also indicates how if you want to get on the Internet, you can access our Environmental Impact Statement. And that link that's on the slide is a pretty long one but it works. I tried it. It works just fine. However, if you have any difficulties with it or for some reason just are frustrated at the keyboard, give me a call and we will go through it one small step at a time until you get what you're looking for.

Other ways that we can receive comments, you can certainly send a letter into the NRC staff that'll end up on my desk by so called snail mail. I would ask that you address that letter though to the Chief of our Rules and Directives Branch. And what that does is that guarantees that your letter will be put in the public record. Whether or not it goes to Rules and Directives or directly to me, I will nevertheless make sure that all comments that come in do get put in the public record.

It's a long shot but if by chance anybody happens to be in the Washington D.C. or the Rockville, Maryland area where our Headquarters is located, you can certainly stop by and visit with us personally. And I will receive your comments. Whether I write them down or you write them down, though, the comments, before you leave, will end up being put on paper, again, so that I can get them into the public record. Or you can send in comments to the NRC staff at the e-mail address that is at the bottom of the slide. This address was created for the expressed purpose of providing the public another avenue of communicating with the NRC staff on this environmental review.

Now, it's an e-mail address. It is not a bulletin board. So if somebody who makes a comment wants to see what other comments have been made by other people, you wouldn't be able to get that information directly off of, you know, by coming into us at that e-mail address. There are ways, though, that you can find out what other people have said. And that is we do have a document management system that I will feed all of this into which can be accessed through our web site and all the information can be found through that system. If you want to know what's been said either by e-mail or other letters that have come in. And, of course, the transcripts of this meeting will also be on that web site. If you're not real familiar with our



system and are planning to play with it for the first time, my strong recommendation is that you just call me first. It might save a lot of frustration.

That concludes my prepared remarks and if there are no questions, I'll turn it back over to Chip.

**MR. CAMERON:** Okay, thanks, Duke. And that part of the meeting where we ask any of you who want to make a more formal comment on the Draft Environmental Impact Statement to come up and talk to us.

And Molly, did you want to make a comment, Molly Regan? You weren't sure at the beginning. I was just checking in with you.

**MS. REGAN:** No, I'm fine.

**MS. CAMERON:** Okay. Let's go to Bennett, Bennett Brown to come up and talk to us. Or you can do it from your seat. Okay, thank you, Bennett.

Anybody else have a comment at this point? Are there any final questions about schedule or commenting or anything like that that people need answers to?

Okay, I just want to emphasize that we're ending early but the NRC staff, and we're going to go to Bennett in a second here, is the NRC staff will be here after the meeting to talk about any of these subjects informally. And we talked about environmental review, we talked about the safety evaluation. I just wanted to mention, just introduce some people on the inspection side of the NRC staff. And, of course, we do have resident, resident inspectors at every plant. And I wanted to introduce our residents at Quad Cities. Senior Resident Karla Stoedter and I'll probably never get that right, and Mike Kurth and they're our residents.

And we do in every region or at least in this region we do have a lead inspector for all the plants in the Region for license renewal and that's Laura Kozak, who's right here. And do we also have our Branch Chief from the Region 3 Office, Mark Ring, who is right here. And we have other NRC staff with us from Headquarters. So if you have some questions, we have the people here to answer them.

And let me go to see if Bennett has another question or comment for us. Bennett?

**MR. BROWN:** I do have a couple other comments. I just wanted to give other people the opportunity to speak first since I had spoken during the presentation.

My comments fall into two categories and I'm really speaking under two different hats. The first is simply as a physicist interested in energy and safe reliable energy production. I studied

## Appendix A

physics at MIT. I had the opportunity to work briefly in a reactor. I'm by no means afraid of nuclear reactors but I think it's extremely important that they be operated safely and that safe designs, that we restrict ourselves to safe designs.

The design of the Quad Cities plant concerns me, not the design, the Quad Cities plant at this point concerns me really on two different grounds. The first one I've spoken to. It's a design issue. And I think it's simply an outdated design. I think there were mistakes made when the design was implemented. I think that the best attempt made possible has been made to correct those design problems so that the plant can live out its 40-year license period.

QC03-1 | And I don't feel as a physicist that it's appropriate to renew the license for a plant that bypasses such a fundamental component of its containment and safety systems. To give you an example, it was just this last April there was a scram. I found it shocking that you thought not many people in here don't know what a scram is. How many of you know what a scram is? Come on. Okay, okay, so significant. Forgive me for the antics. And it's appropriate. Everybody should be on board with the conversation.

Last April there was a scram at one of the two Quad Cities reactors. Scrams are hard on the plant's valves. The assert pressure transients. They're rapid changes in temperature and pressure throughout the reactor that's hard on materials just like it's hard if you heat up a piece of cookware and then stick it in the sink, it's likely to shatter under the sudden changes in temperature.

QC03-2 | Now, the plant is designed to be able to withstand a scram. But it still ages the plant and there are a number of scrams that have occurred at this plant over the years. The most recent one that I'm aware of, though I imagine it's probably not the most recent one considering the frequency with which they occur, was in April.

And in that incident a valve that connects the reactor core to the torus, that I was speaking of earlier, was open and stuck open. I'm not privy to the reasons that that valve was open or the reason that it was stuck open. It's a couple of systems to close it, both failed and a manual attempt to close the valve, as I understand, also failed. So the reactor was scrammed because steam was venting into the torus and that torus water was heating up.

At the time that the reactor was scrammed, the torus water had already heated up from what I presume is its normal temperature of ground temperature, which would be in the 50 Fahrenheit or 20 degree Celsius and it had already heated up to 95 degrees Celsius. Now, boiling of water occurs at 100 degrees Celsius.

The torus is designed to be able to not boil, to not have to vent to the atmosphere as long as the scram is initiated at a temperature that's 110 degrees or less. So it was already at 95 and

rising and they scrambled and they were successful in scrambling. A scram, if everything goes correctly, takes just a few seconds. So no release occurred and it was business as usual and the plant returned to full power after the NRC returned to control the plant to Exelon the following day.

I believe all my details there are correct but I don't work at the plant. I see a couple of you shaking your head. Please —

MR. RING: There's probably several people that can talk to this. My name is Mark Ring and I'm the Regional Branch Chief and I think you got your Celsius and Fahrenheit values a little bit mixed up. I'd have to ask Carl or Mike probably but I think it started in the 70's somewhere, went to about 90 degrees or so. Actions were being taken and I think the high point was maybe around 110, 120, something like that.

MR. BROWN: Fahrenheit?

MR. RING: Right.

MR. BROWN: So the scram was initiated 95 degrees Fahrenheit and water — oh, this is the NRC log of the event. Okay, so the scram was initiated at 95 Fahrenheit. Water boils at 212 Fahrenheit and the plant is designed to be able to contain the problem as long as the scram is initiated at 110 Fahrenheit or less. And the water peaked at 118 Fahrenheit and there was no problem. Now I have the details correct.

I'm not going to speak anymore about the incident. I don't think it was a particularly unusual incident. I only raise it because I think that this is a serious problem with this reactor. Here we had one valve that failed, stuck open. And we were within 15 degrees Fahrenheit of the limit at which had we gone above that we would had to have vent the torus to the atmosphere, as I understand it.

13-3 I think it's unnecessary to continue operating a reactor beyond the year 2012 given that it has a fundamental design flaw. So that's the first of my objections to this particular reactor. And I would like to see the torus vent system addressed in the SEIS.

13-4 The second concern that I have is actually more alarming to me. As I say, I'm not an alarmist about nuclear power. I worked for many years with radioactive tracers in a biology lab. And this plant is aged. It's part of a fleet of boiling water reactors that have shown unexpected stresses due to radiation. After the first surprise event at which cracking of a core shroud was observed, I believe that that was in Ohio. Does anybody know, they can fill in the blank for me there? I think it was Davis Bessie but I just don't want to be citing things. I'm not speaking off of notes on this event.

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So a boiling water reactor was observed on inspections that weren't particularly routine to look for this so it was a surprise that there were cracks in the core shroud, the shroud that contains the core. And it was identified that they were of serious concern and a survey was undertaken by the NRC of other boiling water reactors in the country.

QC03-5 The cracking was found to be widespread in the core shrouds and was a result of radiation exposure of the metals to the radiation from the core. This particular plant, the core shroud on one of the reactor cores exhibited severe cracking. The NRC classifies the cracking in this study as none, slight, moderate and severe. And at the Quad Cities plant the core shroud cracking was severe, in some cases with fissures up to a half of an inch in the core shroud wall and they hadn't yet penetrated through the wall but if they did, that would be a disastrous event.

QC03-6 The core shroud is not the only component of the core that is subjected to this radiation and it's subjected to the type of aging that I'm speaking of. The components that concern me the most are the plates which keep the rods, both the control rods and fuel assembly rods in place so that if sudden insertion of a control rod is necessary, as it is every time a plant scrams, if those plates are worked or have crept or have buckled, all of these are consequences of radiation exposure of metals, then it's completely plausible that the control rods will be unable to insert as expected during a scram. If a plant fails to scram, the reaction continues and the heat has to go somewhere. That would be the torus, which brings me back to the design flaw of this particular plant.

QC03-7 So, to summarize, I think there are two problems with the Quad Cities plants. Number one, QC03-8 they utilize an old flawed design that should be retired. And number two, they are subject to aging. That aging will be 40 years by the time of this license expiration. And the NRC study fairly clearly showed that reactors that were greater than 20 years old exhibited an unexpected spike in their aging characteristics.

To back up, when they look at the plant and looked at whether there was none, slight, moderate or severe cracking in the core shroud and presumably in other internal components of the core that were not so easily examined without full removal of all the fuel assemblies, they found the plants that were younger of 20 years mostly exhibited no aging of this type and plants that were more than 20 years old almost all of them exhibited cracking of this type.

QC03-9 So I think to operate this for 40 years is iffy and I think to extend the license for 20 years is unnecessary. So that's the first category of my assignments and it's the first hat I'm wearing as a physicist.

QC03-10 The second comment that I would like to make to the NRC and to be included in the SEIS concerns specifically alternatives considered in the impact statement. And I'd like to address specifically Section 8.2. So, in Section 8.2.3 you consider new nuclear power generation. And I

think it should be mentioned that there's a specific site being considered that Exelon has applied for an advance site permit for the construction of a new nuclear reactor in Illinois. And as you consider alternatives to this aged plant, I think it's relevant to mention that there is an alternative site already being assessed and considered by the NRC.

The second category of alternative I'd like to address is Section 8.2.5.2 and for those of you that have the appendix here, the SEIS draft, that's Pages 8-49 to 8-50. And that's about wind energy. And it's in this regard that I speak not as a physicist necessarily but as a board member and treasurer of the IWORLD Renewable Energy Association. I have been monitoring wind speeds in Iowa for a number of years. I live about 50 miles west of here, slightly north. And I'm part of an NSF funded study that looks at wind correlation.

03-11 And I find a section on considering wind energy as a replacement for the Quad Cities plants incomplete and in some cases misleading. So specifically what I would like to see you include in that assessment, you cite four reasons that wind is not an alternative to consider for nuclear power. And I'd like to address each one of those in turn, if you will give me the time needed to address that. I won't speak for long and I will be concise.

MR. CAMERON: Go ahead.

MR. BROWN: Thank you. The four arguments against wind that are advanced in the SEIS, in the plant specific environmental impact statement, the first one is that the power required to replace the Quad Cities plant is marginally present in Illinois. Specifically, this was the one point mentioned in today's presentations. Specifically that 4,200 megawatts would be needed to replace the plant capacity at Quad Cities.

And to be clear, with wind you have to distinguish between what is name plate on the turbine, you know, at the base of the tower, a one megawatt turbine, that's not what that turbine produces all the time because wind blows at varying rates. So that's the name plate capacity. And as was stated in your presentation, it would require 4,200 megawatts of name plate capacity of turbines to replace this nuclear power plant. That would, in effect, only be about 1,000 megawatts of consistent power production on average through the year.

So, 4,200 megawatts; that's a lot of power. Illinois only has 3,000 megawatts of Class 4 Wind Sites it says in the SEIS. That's probably not part of your field of knowledge since I see that most of you are within the nuclear realm. The Patel Class, the Department of Energy has classified U.S. land by how windy it is. The higher the number, the more the wind. A Patel Class 4 right now is developable. Wind farms are being built in the United States in Class 4 sites. Illinois has only 3,000 megawatts of Class 4 capacity.

## Appendix A

That's not enough. There are an additional 6,000 megawatts of Class 3 sites but those aren't as windy and therefore averaged over the year the cost per kilowatt hour is a little higher if you were to develop that wind. And utilities aren't interested in developing that wind for a good reason. They can put the turbine elsewhere to get more bang for their buck.

QC03-12 What's misleading is to use Illinois numbers. This plant, after all, is on the border of Iowa and Illinois. Illinois has a pathetic wind resource. I don't mean that to any detriment of Illinois but it's not a windy state despite Chicago's moniker.

Iowa is a windy state. In fact, Iowa has enough Class 4 and better sites to replace the Quad Cities, both of the Quad Cities plants 20 times over. Furthermore, north of Iowa, in the Dakotas, we could easily power the entire Midwest on turbines. The only issue would be how do you get the power to the population centers? The areas that are easily developed in the Dakotas are not on transmission lines so part of the cost of developing those turbines would have to include transmission.

So the first point here that sufficient power is marginal I think is incorrect. There is more than enough wind power in the vicinity to replace the Quad Cities.

Second, the NRC document mentions that it is enormously, and this is a quote, enormously expensive to develop these wind resources. I had the opportunity on Friday to attend the Midwest Regional Wind Collaborative. It was a meeting of about 15 people that included utility commissioners from Montana, the Dakotas, Minnesota. It also included legislators from as far south as Kansas. And the purpose of this meeting was to develop a regional plan for developing our wind energy resources and delivering them to market.

The subjects were broad ranging from how to develop it to how to monitor tradeable permits and so on. At that meeting were many utilities. I spoke with a person from Bason [?] Electric, a fairly large rural electric cooperative within what was formally the Map Region. It's a portion of the grid. And this fellow confided in me that a price that they were able to bring wind energy to market. So I will share with you what he gave to me as a public figure, which is that they are currently producing wind at two cents to two and-a-half cents per kilowatt hour.

That figure is flat for 20 years. So for the next 20 years they will be able to produce, and their total production is in the hundred megawatt range of wind. So it's sizeable. Two to two and-a-half cents of kilowatt hour is small when you consider that that includes capitalization of the turbine, it includes the transmission and roads necessary. It includes the interest on the capitalization. It includes the operation and maintenance. And it includes the fuel, which of course is free.

So, two to two and-a-half cents is definitely cost competitive with even a gas turbine, let alone a new nuclear power plant particularly if you omit the Price Anderson Act under which the nuclear industry has collectively said that nuclear power would not be economically feasible to develop if the nuclear industry had to carry liability for any accidents that were to occur.

3-13 So, I think to say that it is enormously expensive to develop is only correct in a silly expense. It is expensive. Power's expensive. It takes a lot of money to build a new nuclear power plant. It takes a lot of money to operate a nuclear power plant and it takes a lot of money to develop wind. But to compare it to other fuel sources I think is simply false. It's not economically expensive to develop in comparison with other fuels. It is economically viable.

3-14 The third point that the NRC document brings up is that the land use of turbines would be significant. And I bring this up because it is, after all, an environmental impact statement. Wind may be cheaper. It may not have the risk of accidents. We may not have to deal with the tailings from uranium mining or the terrorist problems with a power plant nor the storage problems with the waste. But wind turbines will take up land. A two megawatt turbine takes up about a quarter of an acre of land that you can farm right up to the turbine.

If you were to replace the Quad Cities plants, they would take about a square mile. It's not a significant consumption of land and it is an environmentally responsible consumption of land. It is a good neighbor to the farmers. In fact, farmers are clamoring to have wind turbines on their farms. I don't see a line of farmers here clamoring to have caskets on their farms. So, I think that the NRC needs to develop that section quite a bit more.

3-15 And finally the fourth point that SEIS brings up is that wind, I forget the wording, that wind can only provide intermittent power. That the Quad Cities plants provide a base load power that simply cannot be replaced by wind. This statement is inconsistent with a variety of conclusions that utilities both within the United States and internationally have reached.

To be specific about wind, I feel like there needs to be some education on this point so I'm going to belabor it a little bit. There are three ways in which the wind fluctuates. You get the gust. That's less than one second transience. Then you get the fluctuations that are from a second to ten minutes. And then there are fluctuations that are longer than that, the very short and medium term fluctuations.

3-16 Studies have been commissioned by the independent system operators that maintain the grid. And the conclusion is that the use of wind does not represent any change necessary to the grid of the United States as long as penetration is up to 25 percent. We could replace 25 percent of our electricity generation with wind and not have to change the grid at all. If we were to go beyond 25 percent penetration, we would have to address the fact that wind gusts.

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The fluctuations in the wind, today it flows, tomorrow it doesn't, that's at one turbine. If you're talking about replacing two plants that are each hundreds of megawatts, you're talking about many, many turbines at different locations, some of them grouped in a farm so that when a gust hits one turbine it's not at another and averaged over that wind farm, it's a steady output power. And averaged over days, one farm, one wind farm is not particularly windy, another wind farm is. So the output power on a day to day basis even is fairly constant. It is a feasible base flowed production of energy.

One issue, however, is that it's not windy in August. It is windy in January. August is when we need power. It's when people turn on their air conditioners. And as such you have to design the wind production so that you build enough wind turbines so that even in low August wind power generation months you're generating enough power to service August demands. But that's simply a cost issue and when you do out the numbers, as I said, it is economically viable.

QC03-17 So, in conclusion, wind energy, I believe, is a very viable replacement for the Quad Cities plants. In neighboring Iowa, it could be done very easily. In the Dakotas it would require some transmission. The Lady Foundation has done some research on what transmission would be necessary to bring Dakota power to Chicago. It comes out to about two cents a kilowatt hour averaged over the lifetime of those transmission lines. It's not significant even to use Dakota power with new transmission. So thank you for your attention.

MR. CAMERON: Thank you, Bennett, for those specific suggestions and comments. Does anybody else have a comment or question before we adjourn for the night? Yes.

MS. PERRIGO: I'm Leslie Perrigo, again. I'm from ICAN and I'm actually, I'm also on the Board of IRENEW and as a follow up to one of Bennett's point about transmission lines and where the power comes from, we have contacted the Iowa Utility Board and they could not speak for the Illinois Quad Cities. But the Iowa Quad Cities only receives 23.6 percent of our power of total net generation from nuclear sources. Of those nuclear sources, they come from two separate power plants. One is in Nebraska and the other one is the Quad Cities plant.

MR. CAMERON: Thank you, Leslie.

Bennett, can you just make this short? I mean, your comments are very thought provoking and appreciated.

QC03-18 MR. BROWN: Thank you. I realize that I've taken more than my share of the air time if you divide the hours by the people in here. But the primary comment in the SEIS statement was that it would represent a doubling of U.S. wind capacity if we were to replace the Quad Cities plants with wind. That's true but it's, again, it's a irrelevant statistic. In fact, the Senate, as I'm sure you're well aware, considered a law that were required us to bump up to ten percent of our



generation from renewables, primarily wind, by 2010. This plant expires in 2012 with its existing license. So already the Senate was considering mandating going from 0 something percent of our capacity up to 10 percent, which would be like a twentyfold doubling before the plant is even up for its new license period.

MR. CAMERON: All right, thank you.

John, do you want to close us out?

MR. TAPPERT: Just want to thank everyone for coming out tonight and sharing your thoughts with us. And just to remind everyone, if you have some comments that you would like to share with us in the future, our comment period does extend till January 27th. So, you have our e-mail addresses and our phone numbers. So, please send those to us.

And thanks for coming out again tonight and have a good evening.

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QC04-1 I understand that this is the last day for input re the Cordova Nuclear facility. I have been concerned about it for a good number of years, particularly when flocks of birds were found dead near it. We are fighting terrorists without, but living with the potential for terror within.  
QC04-2

About 15 years ago I asked a speaker for the plant what the plan was for when it was closed down. He said he didn't know, was not an engineer, but supposed that it could be cemented over. I didn't find this particularly reassuring because of the condition of many of our roads.

QC04-3 Is there new technology for permanently sealing it off? I understand it was not constructed properly for chimney emissions and that correcting this problem would be terribly expensive.  
QC04-4

QC04-5 How about rationing energy use instead? We are a very wasteful society. Somehow its ok to kill and have our young people killed in order to keep energy available. I don't find this acceptable.

Please advise.

Note: Ms. Monahan gave this note to the NRC staff following an NRC public meeting on December 16, 2003, in Moline, Illinois. The purpose of the meeting was to receive public comments on a draft environmental impact statement relate to a proposed license renewal for Quad Cities, Units 1 and 2.  
L. WHEELER, NRC Staff  
E-EDS=ADU-D3      ccc = D. Wheeler (DWW)

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 by smtp-gateway ESMTP id i01DeFU3012282  
 for <QuadCitiesEIS@nrc.gov>; Thu, 1 Jan 2004 08:40:15 -0500 (EST)  
 Received: from sdn-ap-017neomahp0171.dialsprint.net ([63.190.104.171] helo=homepc)  
 by grebe.mail.pas.earthlink.net with smtp (Exim 3.33 #1)  
 id 1Ac38S-0004kB-00  
 for QuadCitiesEIS@nrc.gov; Thu, 01 Jan 2004 05:45:12 -0800  
 Message-ID: <002701c3d06d\$794985a0\$ab68be3f@homepc>  
 From: "Karene Nagel" <miamidolfans@earthlink.net>  
 To: <QuadCitiesEIS@nrc.gov>  
 Subject: Say NO to Renewal-Extension of Cordova Plant  
 Date: Thu, 1 Jan 2004 07:45:09 -0600  
 MIME-Version: 1.0  
 Content-Type: multipart/alternative;  
 boundary="====\_NextPart\_000\_0024\_01C3D03B.2E03E180"  
 X-Priority: 3  
 X-MSMail-Priority: Normal  
 X-Mailer: Microsoft Outlook Express 6.00.2800.1158  
 X-MimeOLE: Produced By Microsoft MimeOLE V6.00.2800.1165

QC05-1  
 QC05-2  
 QC05-3  
 QC05-4

I am writing to express my dismay and horror at the thought of any extension to the use of the Cordova Nuclear power plant! I am a citizen with a family living in the shadows of this plant. Personally, I wish all nuclear plants had *never* been built! They are a constant threat to our environment, and in fact to our lives. The waste aspect alone caused by nuclear plants is enough reason for me to object vehemently to them. In addition, we now face the added threat of terrorists using a nuclear plant for their evil purposes! Renewable energy is where all of our resources and development should be placed. I have felt this way for many, many years.

QC05-5  
 QC05-6  
 QC05-7  
 QC05-8

All of this aside even, I must stress that any extension of this plant's operations beyond it's original intended use is utterly unthinkable! Surely, this would be asking for disaster! This plant has NOT operated without problems or violations, therefore why would you seek to continue operations of Quad Cities Units 1 and 2, beyond their useful life span of 25 years. There is always an unknown factor of wear and tear on these reactors; this can not be seen or accurately measured, but will over time increasingly put all life around them at higher risk. Also, this plant and most others were designed and built long before 9/11; and therefore they have inherent risks to terrorist attacks, which we never planned for.

QC05-9

Please do not endanger me and my family, and our environment by allowing the Cordova plant to continue operating beyond it's original useful life-span!!!  
 This is truly a matter of life and death, do not let it be a matter of *money* in some corporate pockets!

Yours truly,  
 Karene Arp Nagel  
 2517 LaClaire St.  
 Davenport, Iowa 52803

Appendix A

Received: from igate.nrc.gov  
by nrcgwia.nrc.gov; Tue, 16 Dec 2003 06:36:40 -0500  
Received: from smtpout-3102.bay.webtv.net (smtpout-3102.bay.webtv.net [209.240.204.193])  
by smtp-gateway ESMTP id hBGBVeU3014308  
for <QuadCitiesEIS@nrc.gov>; Tue, 16 Dec 2003 06:31:41 -0500 (EST)  
Received: from storefull-3135.bay.webtv.net (bay-6me-tv-1a-natpool-1.bay.webtv.net [209.240.207.249])  
by smtpout-3102.bay.webtv.net (WebTV\_Postfix+sws) with ESMTP id 0FB8EBE3B  
for <QuadCitiesEIS@nrc.gov>; Tue, 16 Dec 2003 03:36:30 -0800 (PST)  
Received: (from production@localhost) by storefull-3135.bay.webtv.net (8.8.8-wtv-  
f/mt.gso.26Feb98) id DAA09780; Tue, 16 Dec 2003 03:36:29 -0800 (PST)  
X-WebTV-Signature: I  
ETAtAhQ/sDpltVwr3OfxyoaPtdUmJj0owIVAMwYqplWXT9iCF3wKlk91ZQ8UJII  
From: patjeffery@webtv.net (Pat Jeffery)  
Date: Tue, 16 Dec 2003 05:36:29 -0600 (CST)  
To: QuadCitiesEIS@nrc.gov  
Subject: Personal Plea  
Message-ID: <6773-3FDEEE3D-3380@storefull-3135.bay.webtv.net>  
Content-Disposition: Inline  
Content-Type: Text/Plain; Charset=US-ASCII  
Content-Transfer-Encoding: 7Bit  
MIME-Version: 1.0 (WebTV)

QC06-1  
QC06-2  
QC06-3

The QuadCities need to have the generator at Cordova repaired, better yet , replaced. It is no longer safe to use. Please find other more suitable fuel alternatives. Don't keep this plant open for another twenty years. I speak for my whole family, and all my neighbors. They, like my husband and me are older and handicapped. We can't get to the meetings, etc., so I've chosen this method of contacting you with our plea to get rid of the nuclear generator plant in our midst.  
Sincerely,  
Diane P Jeffery and Elmus M Jeffery  
1116 40 Street  
Moline IL 61265



United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Custom House, Room 244
200 Chestnut Street
Philadelphia, Pennsylvania 19106-3904

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January 16, 2004

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The U.S. Department of the Interior (Department) has reviewed the Generic Environmental Impact Statement (EIS) for License Renewal of Nuclear Plants, NUREG-1437, Draft Supplement 16 (dated November 2003), regarding Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2, Rock Island County, Illinois.

QC07-1

The proposed license renewal does not involve any major construction, refurbishment, or physical alteration of the project area. The Generic EIS and Draft Supplement 16 adequately address the concerns of the Department regarding fish and wildlife resources, as well as species protected by the Endangered Species Act. We concur with the preliminary conclusions of the U.S. Nuclear Regulatory Commission staff with respect to the impacts of continued operations on these resources and species. We have no comment on the adequacy of other resource discussions presented in the document.

We appreciate the opportunity to provide these comments.

Sincerely,

Michael T. Chezik

Michael T. Chezik
Regional Environmental Officer

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Call - D. Wheeler (DX)

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Exelon Generation  
4300 Winfield Road  
Warrenville, IL 60555

www.exeloncorp.com

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68FR 64372 10 CFR 51

(5)

RS-04-010

January 26, 2004

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Washington, DC 20555-0001

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Quad Cities Nuclear Power Station, Units 1 and 2  
Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265

**Subject:** Comments Concerning Draft Plant-Specific Supplement 16 to the Generic Environmental Impact Statement Regarding License Renewal for Quad Cities Nuclear Power Station

**Reference:** Letter from Louis L. Wheeler (USNRC) to John Skolds (Exelon Generation Company, LLC), "Request for Comments on the Draft Plant-Specific Supplement 16 to the Generic Environmental Impact Statement Regarding License Renewal for Quad Cities Nuclear Power Station," dated November 4, 2003

This letter is being submitted in response to the NRC's request for comments concerning the draft plant-specific Supplement 16 to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," regarding the renewal of operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2, for an additional 20 years of operation.

Exelon Generation Company, LLC appreciates the opportunity to comment on draft Supplement 16 to NUREG-1437. We agree that the adverse environmental impacts of license renewal for Quad Cities Units 1 and 2 are not so great that preserving the option of license renewal for energy-planning decision-makers would be unreasonable.

Specific comments on draft Supplement 16 to NUREG-1437 are provided in Attachment 1 and comments pertaining to Severe Accident Management Analysis (SAMA) are provided in Attachment 2.

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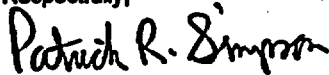
*E-RIDS = ADM-03  
Call = J. Wheeler (JW)*

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January 26, 2004  
U. S. Nuclear Regulatory Commission  
Page 2

If you have any questions, please contact Al Fulvio at 610-765-5936.

Respectfully,



Patrick R. Simpson  
Manager – Licensing

**Attachments:**

**Attachment 1: Comments on Draft Supplement 16 to NUREG-1437**

**Attachment 2: Comments on SAMA**

**cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station  
Illinois Emergency Management Agency – Division of Nuclear Safety**

## Appendix A

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### Attachment 1

Specific Comments on Draft Supplement 16 to NUREG-1437



	Number	Location (pg/line)	What is in DEIS	What should be in DEIS	Why the change
QC08-1	1	Pg xviii / 14	... specified in the National Electric Safety ...	... specified in the 1981 National Electric Safety ...	The year of the National Electric Safety Code that the NRC uses in the GEIS for analyzing this issue should be specified in the report.
QC08-2	2	Pg 2-13/35	... (ComEd 2000).	... (Exelon 2003a).	The reference for the NPDES Permit is incorrect.
QC08-3	3	Pg 2-47/38	... and plotted it on land that would ...	... and plotted on or near land that would ...	Changes make wording consistent with prior sentence describing approximate location.
QC08-4	4	Pg 2-48/11-16	Though he felt what he had observed had little likelihood of proving significant, he recommended 'use of due caution' during excavation.	Though he felt that the likelihood of what he observed as proving significant was remote, he had alerted appropriate plant personnel to the areas of interest and they were to use due caution during excavation operations.	The replacement wording comes directly from the letter and, more appropriately, characterizes Mr. Bareis' findings in his letter.
QC08-5	5	Pg 4-16/17	Blank line.	Remove line.	The line appears to be unnecessary.
QC08-6	6	Pg 4-20/9	Consideration of mitigation is warranted in the vicinity ...	Consideration of mitigation may be warranted in the vicinity ...	This wording change is in keeping with the wording used elsewhere in the report
QC08-7	7	Pg 4-25/33	... to perform routine maintenance and other activities....	... to perform routine maintenance and other activities related to license renewal.	As noted in the Environmental Report and the GEIS, the assumption used is that these additional personnel would be needed to perform those activities related to aging management activities that need to be performed as a result of the renewing the license.

	Number	Location (pg/line)	What is in DEIS	What should be in DEIS	Why the change
QC08-8	8	Pg 4-25/34	... these routine activities during scheduled outages.	... these routine activities.	As noted in the Environmental Report and the GEIS, the assumption used is that these additional personnel would be needed to perform those activities related to aging management activities that need to be performed as a result of the renewing the license.
QC08-9	9	Pg 4-25/35 - 38	... to their permanent staff during license renewal....	... to their permanent staff during the license renewal period....	Wording change for grammatical reasons.
QC08-10	10	Pg 4-30/15 - 17	The Quad Cities site is in an area of moderate-to-high potential. However, there are reports of archaeological resources on the Quad Cities site.	Areas of the Quad Cities site may have moderate-to-high potential. There is a report of an archaeological resource on or near the Quad Cities site.	The archaeological reports cited as a the basis for this statement do not state that the entirety of the Quad Cities site possesses the possibility for moderate to high potential. Furthermore, there are no references cited from any State or National source (other than the University of Chicago report listed on pg 2-47) that could be used to form the basis for the conclusion regarding areas having a potential for archaeological resources.
QC08-11	11	Pg 4-31/32-33	... for guidance on requirements for an archaeological survey when any ...	... for guidance when any ...	This wording change is needed to bring into it into conformance with what was committed to by Exelon in e-mail under ADAMS Accession # ML033090462.

	Number	Location (pg/line)	What is in DEIS	What should be in DEIS	Why the change
QC08-12	12	Pg 4-32/1	... the staff's preliminary determination is ...	... the staff's determination is ...	Wording change needed for final report.
QC08-13	13	Pg 4-39/ 24, 30, and 32	These lines mention Exelon practices as they pertain to vegetation management in the transmission corridors. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerican and Alliant).		
QC08-14	14	Pg 4-40/12	... the staff has preliminarily concluded that ...	... the staff has concluded that ...	Wording change needed for final report.
QC08-15	15	Pg 4-40/18	This line mentions Exelon practices as they pertain to vegetation management in the transmission corridors in this review. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerican and Alliant).		
QC08-16	16	Pg 4-40/19	... it is the staff's preliminary finding that ...	... it is the staff's finding that ...	Wording change needed for final report.
QC08-17	17	Pg 4-44/30, 41	These lines mention Exelon practices as they pertain to vegetation management in the transmission corridors in this review. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerican and Alliant).		
QC08-18	18	Pg 4-44/41	... and its contractors at the end of the consultation,		It is not clear what consultation the staff is referencing in this section.
QC08-19	19	Pg 4-46/18	Agency for direction on level of effort necessary for archaeological survey in such project areas, ...	Agency for guidance, ...	This wording change is needed to bring into it into conformance with what was committed to by Exelon in e-mail under ADAMS Accession # ML033090462.
QC08-20	20	Pg 4-50/18, 37	These lines mention Exelon practices as they pertain to vegetation management in the transmission corridors in this review. There is no discussion of the owners of the other transmission lines under this review (i.e., MidAmerican and Alliant).		
QC08-21	21	Pg 4-51/1-2	... the staff has preliminarily determined ...	... the staff has determined ...	Wording change needed for final report.
QC08-22	22	Pg 4-51/35	... the staff's preliminary conclusion ...	... the staff's conclusion ...	Wording change needed for final report.
QC08-23	23	Pg 4-51/39	... the transmission line owner, ComEd, is ...	... the transmission line owner, Exelon Power Delivery, is ...	Wording change reflects the addressee in the letter sent (ADAMS Accession #ML032660228).

Number	Location (pg/line)	What is in DEIS	What should be in DEIS	Why the change
QC08-24	Pg 8-427, Pg 8-45/31 - Pg 8-48/12, Pg 9-8/16	These discussions of aesthetic impacts of the alternative nuclear plant are not consistent with the analysis presented in the GEIS for aesthetic impacts of license renewal for the existing plant. During the construction of the alternate plant on the Quad Cities site, impacts would be introduced that may bring the overall site to a MODERATE level of impact, however, once the alternate plant is operating and the existing site is fully decommissioned, the overall impacts would not be much different than what currently exists. As stated in the GEIS in the conclusion of the analysis of this issue, the "staff believes that the impacts on aesthetic resources would be small in the future". For this reason, Exelon believes the staff should review their conclusions with respect to their analysis of this issue.		
QC08-25	25 Pg 8-48/20 - 22	Duplicate of lines 18 - 19 that can be deleted.		
QC08-26	26 Pg 9-5/8	... the staff's preliminary conclusion is ...	... the staff's conclusion is ...	Wording change needed for final report.
QC08-27	27 Pg 9-8/5	LARGE, under Historic and Archaeological Resources	SMALL, under Historic and Archaeological Resources	This makes the wording here consistent with the conclusion in Section 4.4.5.
QC08-28	28 Pg 9-8/31	... MODERATE....	... MODERATE for that portion of the North Nelson line where the induced shock is greater than 5 ma.	This wording change clarifies the area where the impact has been analyzed as being MODERATE.
QC08-29	29 Pg 9-8/32	... considered LARGE....	... considered SMALL....	This makes the wording here consistent with the conclusion in Section 4.4.5.

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**Attachment 2**

**Comments on SAMA**

Comments on SAMA

Exelon's Severe Accident Management Analysis (SAMA) was an extensive exercise that was done to determine if proposed plant changes are required to support license renewal for the Quad Cities station. Exelon concluded that none are needed to support license renewal and the Nuclear Regulatory Commission (NRC) has agreed (Quad Cities Draft Environmental Impact Statement (QC DEIS) pg 5-9).

Because the current Exelon evaluation of SAMA improvements is performed only to support license renewal, this analysis was done in a conservative manner. Additional analysis is required to ensure that all aspects, both positive and negative, are captured prior to any actual changes in plant equipment, procedures, or training. This is consistent with the NRC DEIS review that concludes, "further evaluation of these SAMAs by Exelon is warranted" (QC DEIS pg G-30).

Exelon wishes to note the following points that were listed in the NRC review:

- a. The cost ranges provided by Exelon are consistent with those provided by other licensees for similar applications (QC DEIS pg G-18).
- b. The severe accident analysis typically assumes that the proposed change completely eliminates the associated risk (e.g., Phase II SAMA #3 risk calculation). In reality, no modification made can ever be perfect. Such bounding calculations overestimate the benefit and are conservative (QC DEIS pg G-13).
- c. The cost-benefit analysis performed by Exelon did not take into account any replacement power or on-going maintenance costs that may be incurred for any plant modifications. Taking these into account would reduce any risk-cost benefit (QC DEIS pg G-10 through 15).
- d. Both Exelon and NRC agree that significant conservatism exist in the current fire PRA. These conservatisms overstate the actual risk from fire at Quad Cities (QC DEIS pg G-24). The NRC staff reviewers, however, disagreed with a risk multiplier of 5 used by Exelon to account for uncertainties in external events analysis, mostly for fire. The NRC suggested a value of 10. It should be pointed out that the existing 1999 fire PRA study was performed not to provide detailed estimates of fire risk to be used in routine plant analysis, but was limited to the IPEEE purpose of discovery of major fire vulnerabilities. Furthermore, the NRC has provided no basis for the determination of their suggested value of 10. If additional consideration by Exelon were performed, it would include a more realistic review of fire impacts. This more realistic review is expected to verify that the factor of 5 used by Exelon is accurate.

QC08-30

With respect to the specific recommendations by the NRC:

- a. For SAMAs #1 & #2 regarding cooling for the Safe Shutdown Makeup Pump (SSMP) room and alternate drywell spray, the NRC has already concluded only marginal risk-cost benefit exists (QC DEIS, page G-25).
- b. For SAMAs #6 & #8, local electrical breaker operation would require human actions to close breakers onto energized, high voltage buses. Such actions create an industrial safety concern for the personnel performing such actions. Testing the capability to perform such actions would impose actual hazards on personnel during the testing, while the likelihood of ever having to perform the actions during an accident are quite remote (loss of all 125 V DC

QC08-31

QC08-32

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QC08-33

- power is calculated to occur roughly once per 1 million years as documented in the Quad Cities 2002 PRA).
- c. For SAMAs #10 and #14, the changes suggested in the QC DEIS would require deviations from NRC-approved emergency procedure guidelines. Each would be impacted by the change suggested by the Staff as well as causing a significant deviation from the approved Boiling Water Owners Group (BWROG) strategy.

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Dear Sir or Madam,

The Illinois Emergency Management Agency (IEMA) appreciates the opportunity to comment on Supplement 16 to NUREG-1437, the draft environmental impact statement concerning the application for Plant Life Extension (PLEX) at the Quad Cities (QC) site. We have two separate but related issues concerning the application. One directly concerns Supplement 16, the other is more safety analysis related. But because the two are related we will include both in these comments. The two issues are collective occupational radiation exposure, and the condition of steam dryers in both reactors.

Occupational radiation exposure is covered in section 4.6.3 of the generic environmental impact statement (GEIS), NUREG-1437. In this section, NRC evaluates the impact on occupational exposure during the renewal term. They examined baseline trends in cumulative occupational exposure, and the projected increments to occupational dose due to plant aging. The projections were compared with dose levels then being experienced to estimate accumulated dose and spontaneous cancer risk. Table 4.10 indicates that average individual dose rates between 1973-1989 decreased from a ~850 mrem to ~360 mrem at boiling water reactors. This indicates a significant and desirable downward trend. These levels are also well below the 5 rem/year 10CFR20 individual dose limit. The GEIS states that as plants age, there will be a slight increase in radioactive inventories, resulting in slight increases in occupational doses.

NUREG-1437 concluded that over a renewal period, the greatest increment to higher doses was assumed to be a ten-year In Service Inspection outage. The dose increment related to aging was forecast to be an increase of 25%, or a BWR increase from 439 person/rem to 535 person/rem. The range of cancer deaths caused by industry wide collective exposure is 0-17. So the conclusion in the GEIS is that the exposure risk after license renewal is not expected to be significantly different from that during the initial license term, so occupational exposure was made it a category 1 issue.

In draft Supplement 16 for QC, the staff agreed with the GEIS and concluded that there were no impacts related to occupational exposure beyond the

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All = D. Wheeler (DW)



GEIS, the overall impact on occupational exposure is **SMALL**, and *additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted* (Supplement 16, Section 4.3). The conclusion was that the maximum doses during the renewal term is within the range of doses experienced during normal operation and maintenance outages, and would be well within regulatory limits.

In a review of the collective occupational doses at QC from 1999-2002, IEMA determined that the collective doses by year were: 169 person-rem/year in 1999, 847 person-rem/year in 2000, 126 person-rem/year in 2001, and 1,722 person-rem/year in 2002. Two of the four years are quite good; two are quite bad. It is difficult to forecast a trend. We assume plant radiation protection personnel follow rigorous ALARA procedures, and individual doses remain well within regulatory limits.

QC09-1

We understand that collective doses are related to the background radiation levels resulting from the source term from activated corrosion products in the reactor and related systems, and the number of outages at a plant each year. IEMA hopes that 800 and 1,700 person-rem/year level collective doses are not indicative of the doses to be expected during the renewal term. Part of our concern is that the QC plants are in the bottom quartile of nuclear plants in regard to source term. Therefore, we question the NRC conclusion that no mitigative measures are needed in the renewal term. Many of those accumulating these exposures are Illinois citizens.

Therefore, IEMA would like to see as a condition to PLEX application approval, a requirement for the licensee to proactively monitor and control the source term over the renewal period. Decontamination and preventive methods are available to keep source terms under control.

QC09-2

It can be argued that there were an extraordinary number of maintenance outages in those years when the levels were high. Granted, the cause of much of the high exposures in 2002 is due to outages related to steam dryer failures. One plant had back-to-back failures. The plant's UFSARs assume structurally sound steam dryers in their current licensing basis. The QC steam dryers have not remained structurally sound. In addition, the root cause analyses and corrective actions done as a result of the first failure did not prevent the second failure.

QC09-3

Extended power upgrades are speculated to be the root cause of the dryer failures. That may or may not turn out to be the case. Regardless, we assume those increased power levels will extend into the renewal period. We noted from inspection reports that during the scoping inspections done at QC, the steam dryers were not considered reactor internal components for PLEX purposes, although the

FSAR does list them as a reactor internal component. Additionally, they were excluded from age related degradation management programs prior to and during the renewal period. The reason given was because they were non-safety related, and failure is an operational concern, but not a safety concern. We are not so sure.

QC09-4            The conclusions of operability evaluations concerning the steam dryer failures made some assumptions. Among them was that any dryer parts that broke off would stay in the area of the separator/dryer, or be carried down the main steam line, where they would not affect any safety-related functions. It was determined as a result of the second dryer failure, some dryer material did not remain in the dryer area, but did travel through a recirculation loop and into the reactor vessel as a loose part. We anticipate that further engineering safety evaluations will conclude that the loose part(s) will cause no harm in the vessel. Regardless, thus far, steam dryer structural integrity is a present issue and contains large uncertainties over a twenty-year renewal term. Therefore, IEMA recommends that the status of the steam dryers at Quad Cities be re-evaluated as to their non-safety related status under PLEX, and be considered a reactor component subject to an aging management program.

QC09-5            In conclusion, our observations are that recent steam dryer problems at QC have caused forced outages. Only time will tell if the root cause of the dryer failures is a result of an extended power upgrade program. Regardless, the program will extend into the renewal term. It is not clear what effect the upgraded power level program might have on future plant component failures, but the increased number of outages needed to deal with them so far has dramatically increased the collective occupational exposure at the station. This was not anticipated in assumptions that went into the GEIS. Therefore, IEMA would like to see the steam dryers re-classified as a reactor component subject to an age-related degradation program under PLEX, and the licensee be required to commit to a proactive source term management program through the renewal term.

QC09-6            Again, IEMA appreciates the opportunity to submit these comments for consideration. We consider plant life extension to be a practical program in the nation's energy policy, and believe radiation and reactor safety can be maintained over a renewal term if adequate measures are taken to manage age related degradation. Please call me at (217) 785-9875 if these comments raise questions we can respond to.

Sincerely,

Neill Howey  
Senior Policy Analyst

**Bureau of Nuclear Facility Safety  
Illinois Emergency Management Agency**



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Washington, DC 20555-0001

68FR 64372

6

Re: Comments on Draft Supplement 16 to the Generic Environmental Impact Statement  
for the Quad Cities Nuclear Power Station Units 1 and 2 License Renewal Application

Dear Sir or Madam:

QC10-1 These comments are submitted by the Environmental Law and Policy Center ("ELPC")  
QC10-2 on Draft Supplement 16 to the Generic Environmental Impact Statement for the Quad Cities  
Nuclear Power Station license renewal application ("Draft Supplement"). The NRC's analysis in  
the Draft Supplement fails to comply with the requirements of the National Environmental  
Policy Act ("NEPA") in at least two ways. First, there is no analysis in the Draft Supplement of  
whether or not there is a need for the power created by Quad Cities. Second, the NRC has not  
complied with its legal duty to objectively evaluate energy efficiency, renewable energy  
resources, and other clean energy resources as viable alternatives to the renewal of the Quad  
Cities operating license.

I. NEPA Requires That the NRC Thoroughly Analyze the Need for Power

QC10-3 The environmental analysis of the Quad Cities license renewal application is being  
carried out pursuant to regulations that constrain the scope of the analysis in a manner that  
violates NEPA. In particular, 10 C.F.R. 51.95(c) provides that the NRC need not consider "the  
need for power" in determining whether or not to grant a license renewal for Quad Cities. The  
need for power, however, is at the heart of the purpose and need statement which, in turn, serves  
as the baseline by which the reasonableness of various alternatives are to be measured. Without  
this essential factor, there is no way for the NRC to use the EIS process to accurately weigh

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www.elpc.org elpc@elpc.org

ROBERT L. GRAHAM - CHAIRPERSON HOWARD A. LEARNER - EXECUTIVE DIRECTOR

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Add = D. Wheeler (DXW)

alternatives against one another or to conclude whether it is appropriate to allow Quad Cities to continue operating for an additional 20 years. While the NRC suggests that the need for power can be considered by the state government at some later date, it clearly violates NEPA to abdicate the analysis of the "need for power" issue to non-federal decisionmakers long after the EIS process has been concluded.

## II. The NRC Has Failed to Rigorously Explore and Objectively Evaluate All Reasonable Alternatives

QC10-4 The Draft Supplement fails to "rigorously explore and objectively evaluate all reasonable alternatives" to renewing the Quad Cities license, as required by NEPA. 40 C.F.R. 1502.14(a). In particular, the Draft Supplement erroneously rejects energy efficiency and renewable energy resources as not feasible from an economic, technological, and/or environmental standpoint. The analysis of these alternatives in the Draft Supplement is unsupported or it relies on flawed and outdated information. As explained below, energy efficiency, renewable energy sources, and clean distributed generation, in combination with "clean coal" resources, present a lower-cost, safer, and environmentally preferable approach to meeting energy needs than renewing the license for the aging Quad Cities nuclear power plant.

### A. Energy Efficiency Alternatives are Available, Cost Effective, and Environmentally Preferable

QC10-5 The Draft Supplement concludes, with no factual support, that it would not be economically feasible for energy efficiency efforts to replace the power generation that would be lost if the Quad Cities license renewal was denied. (Draft Supplement Section 8.2.5.11, p. 8-54). The Draft Supplement cites a 1992 study suggesting that energy efficiency improvements cost 4 cents for every kilowatt-hour saved. The Draft Supplement then rejects this cost estimate arguing that: (1) if energy efficiency were really that cost-effective it would have already occurred, and (2) replacing the energy produced by Quad Cities would require such a large-scale energy efficiency effort that the cost of energy efficiency would increase well beyond 4 cents. The Draft Supplement, however, provides no support for these contentions and does not even attempt to estimate the cost of using energy efficiency to replace the power produced by Quad Cities.

QC10-6 In contrast to the unsupported analysis provided in the Draft Supplement, recent studies demonstrate that energy efficiency is an even more viable and cost effective alternative. For example, the 2001 *Repowering the Midwest* study,<sup>1</sup> which is one of the most comprehensive clean energy development analyses conducted on the Midwest's energy sector, demonstrated that energy efficiency efforts can significantly reduce the demand for power at a cost of 2.5 cents per kilowatt hour or less – lower than the cost of generation, transmission, and distribution of electricity from power plants. Implementing modern new cost-effective energy efficiency technologies like commercial and residential lighting, heating, ventilation and cooling, industrial motors, refrigerators, and other appliances, will flatten our electricity demand over the next two decades. Using the methodology of the U.S. Department of Energy's 1997 "Five National Labs"

<sup>1</sup> Environmental Law and Policy Center, et al., *Repowering the Midwest: The Clean Energy Development Plan for the Heartland* (2001).

Study (which is an analysis by a working group with members from five national energy laboratories),<sup>2</sup> *Repowering the Midwest* concluded that:

- Energy efficiency efforts can reduce electricity demand by 16% in 2010 and 28% in 2020 vs. a projected base case scenario.
- Energy efficiency efforts can save 50,761 GWh of electricity annually by 2020 in Illinois alone.
- Energy efficiency efforts would be highly cost-effective, requiring an average investment of only 2.5 cents per kilowatt-hour.
- Energy efficiency efforts would reduce net electricity costs in Illinois by \$1 billion by 2020.
- These energy efficiency initiatives use “off the shelf” technologies and equipment that is widely available today.

QC10-7 Other analyses have come to similar conclusions regarding the viability of energy efficiency. For example, the Clean Energy Blueprint concluded that energy efficiency efforts throughout the U.S. could save 915 billion kilowatt-hours by 2010 and 2,512 billion kilowatt-hours of electricity by 2020.<sup>3</sup> Additionally, the economic benefits of greater efficiency should not be ignored. A follow-up analysis of the economic impact of the recommendations in *Repowering the Midwest* concluded that with investments in energy efficiency, 43,000 new jobs would be created and \$4.7 billion in additional economic output would be created by 2020<sup>4</sup>. Clearly, energy efficiency is a technologically and economically feasible alternative to the renewal of the Quad Cities operating license.

QC10-8 Perhaps realizing that energy efficiency alternatives cannot be rejected on their merits, the Draft Supplement also asserts that energy efficiency is not viable because utility deregulation has removed the incentive for Exelon to invest in energy efficiency. Energy efficiency, however, is a cheaper (and less environmentally destructive) alternative to new power generation. Exelon and its subsidiary Commonwealth Edison should consider investments in energy efficiency to meet Illinois’ power needs. But even if they prefer not to do so, that does not obviate the NRC’s legal obligation under NEPA to do so. The point made in the Draft Supplement is legally flawed – an otherwise reasonable alternative cannot be rejected under NEPA simply because an applicant may not want to or cannot carry it out. Cf. 42 C.F.R. 1502.14(c) (agency cannot reject an alternative simply because it is outside the agency’s jurisdiction); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 814 (9<sup>th</sup> Cir. 1999) (same). Instead, the NRC has the legal authority to tell Exelon that there is a better, cheaper, and environmentally preferable alternative to license renewal. The fact that energy efficiency efforts are more likely to materialize as a result of state or federal government initiatives (such as an energy efficiency investment fund or

<sup>2</sup> U.S. Department of Energy, *U.S. Carbon Reductions: Potential Impacts of Energy Technologies by 2010 and Beyond* (1997).

<sup>3</sup> Steve Clemmer, et al., *Clean Energy Blueprint: A Smarter National Energy Policy for Today and the Future* (Oct. 2001), at 11.

<sup>4</sup> Environmental Law and Policy Center, et al., *Job Jolt: The Economic Impacts of Repowering the Midwest* (2002).

an energy-efficient building code) in no way provides a basis for rejecting the economically, technologically, and environmentally feasible alternative of energy efficiency.

#### B. Wind Power is a Viable and Growing Source of Clean Renewable Power

The Draft Supplement's analysis of the feasibility of wind power is also flawed. The Draft Supplement notes that the wind resource in Illinois is sufficient to replace the power currently generated by Quad Cities, but then rejects this alternative for two reasons. First, harnessing this wind power would be a massive undertaking involving nearly a doubling of current wind generation in the U.S. Second, such extensive development of wind power would result in significant land impacts for the construction of turbines and transmission lines.

- QC10-10 The Draft Supplement erroneously rejects wind power, which is a viable alternative. First, the Draft Supplement improperly limits its analysis to wind resources in Illinois. As documented in *Repowering the Midwest*, six of the 10 states with the highest wind power potential in the U.S. are in the Midwest. With some improvements to the transmission grid, wind farms in neighboring states such as Iowa could be a viable source of energy for Illinois. Just as the Quad Cities nuclear power plant supplies 25% of its energy to Iowa, wind farms in Iowa can supply energy to Illinois.
- QC10-11 Second, technological advancements are increasing the amount of power created by wind turbines. The largest commercially available wind turbine is 1.65MW (not 1.5MW as stated in the Draft Supplement), and will likely increase to 2.1MW in 2005, and may increase to 3MW to 5MW in the near future.<sup>5</sup>
- QC10-12 In addition, wind turbines have an availability factor of 98%, higher than most other power sources.<sup>6</sup>
- QC10-13 Third, the cost of wind power has fallen dramatically since the 1980s, with an average generation cost of three to six cents per kilowatt-hour,<sup>7</sup> so that it is now competitive with most other energy sources. In addition, because wind is free fuel, wind power generation bears no risk of fluctuating fuel prices. These technological advancements and economic advantages have led to a substantial increase in the amount of wind power installed – from 2001 through 2003 a total of 3,795 megawatts of wind energy was installed nationwide, raising the total wind energy in the U.S. to 6,374 megawatts.<sup>8</sup> Within Illinois, the first utility-scale wind project has recently begun operations and approximately 1,700 MW of additional wind projects are in various stages of development. Across the border in Iowa, there are 420 MW of wind generation installed with an additional 345 MW in development. In light of these facts, the NRC's concerns regarding the need for substantial growth in the wind industry in order for wind to be a viable alternative are misplaced, especially given that the current operating license for Quad Cities does not expire until 2012.
- QC10-14 The Draft Supplement also overestimates the impact that an expansion of wind power would have. Nearly 95% of the land devoted to a wind power site remains available for other uses such as agriculture. Most new wind facilities would also be located near existing
- QC10-15

<sup>5</sup> Ari Reeves, *Wind Energy For Electric Power: A REPP Issue Brief* (Nov. 2003), at 22.

<sup>6</sup> American Wind Energy Association, *The Most Frequently Asked Questions About Wind Energy* (2002), p. 5.

<sup>7</sup> *Repowering the Midwest*, at p. 26.

<sup>8</sup> American Wind Energy Association, *Wind Power Outlook 2003* (2003); American Wind Energy Association, *Wind Energy Fast Facts* (Jan. 2004).

- QC10-16 transmission lines. Therefore, the land impacts of new wind power would not be significant. In addition, wind generation uses no coolant water, has no emissions and does not degrade land.
- QC10-17 There are very few avian collisions with modern wind turbines.<sup>9</sup>

### C. The Draft Supplement Misstates the Impacts of Solar Power

- The conclusion in the Draft Supplement that Illinois would need a 46-square-mile area of photovoltaic ("PV") cells to replace the power produced by Quad Cities provides a distorted view of the impacts that solar power would have. In particular, the Draft Supplement's suggestion that solar power would have a substantial impact to natural resources and land use ignores the fact that solar power is distributed power. Most solar power units are located on rooftops of buildings, meaning that solar power would not cause land disturbance. In addition, it is important to note that solar PV technology has advanced to the point where PVs are a good source of power, especially in remote areas and to help meet peak power demand. The average solar PV cell has a conversion rate of 12% to 17%, not the 10% assumed in the Draft Supplement.
- QC10-18
- QC10-19

### D. Distributed Generation Is a Clean Alternative for Providing Baseload Power

- QC10-20 The Draft Supplement does not adequately address the opportunities for meeting baseload power needs through efficient on-site natural gas-fired generation, such as Combined Heat and Power ("CHP"), district energy systems, and fuel cells. Such natural gas distributed generation emits substantially less air pollution than coal-fired power plants, and does not pose the high-level waste and safety hazards inherent to nuclear power, and therefore could serve as a cleaner and safer baseload supplement to energy efficiency and renewable energy alternatives. *Repowering the Midwest* estimates that Illinois alone has the potential for 2,162 MW of efficient distributed gas-fired generation by 2010, and 5,000 MW by 2020.<sup>10</sup>

\* \* \*

- QC10-21 For the above reasons, the NRC should complete a rigorous and objective analysis of the need for power and reasonable alternatives such as energy efficiency, renewable energy resources, clean distributed generation, and "clean coal" resources before deciding whether or not to relicense the aging Quad Cities nuclear power plant.

Thank you for the opportunity to comment on the Draft Supplement EIS for the Quad Cities license renewal application.

Sincerely,

Shannon Fisk  
Staff Attorney  
Environmental Law and Policy Center

<sup>9</sup> National Wind Coordinating Committee, *Avian/Wind Turbine Interaction: A Short Summary of Research Results and Remaining Questions* (Dec. 2002).

<sup>10</sup> *Repowering the Midwest*, at p. 83.





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Charles R. Montgomery  
Managing Senior Attorney

January 27, 2004

Chief Rules and Directives Branch  
Division of Administrative Services  
Office of Administration  
Mailstop T-6D 59  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Re: Quad Cities Nuclear Power Station, Units 1 and 2  
Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265

Comments Concerning Draft Plant-Specific Supplement 16 to the  
Generic Environmental Impact Statement Regarding License  
Renewal For Quad Cities Nuclear Power Station

Letter from Louis L. Wheeler (USNRC) to John Skolds (Exelon Generation  
Company, LLC), "Request for Comments on the Draft Plant-Specific Supplement 16  
to the Generic Environmental Impact Statement Regarding License Renewal for Quad  
Cities Nuclear Power Station," dated November 4, 2003

This letter is being submitted in response to the NRC's request for comments concerning the  
draft plant-specific Supplement 16 to NUREG-1437, "Generic Environmental Impact  
Statement for License Renewal of Nuclear Plants," regarding the renewal of operating  
licenses for Quad Cities Nuclear Power Station, Units 1 and 2, for an additional 20 years of  
operation. MidAmerican Energy Company appreciates the opportunity to comment on draft  
Supplement 16 to NUREG-1437. We agree that the adverse environmental impacts of  
license renewal for Quad Cities Units 1 and 2 are not so great that preserving the option of  
license renewal for energy-planning decision-makers would be unreasonable.

MidAmerican's response to the comments of Mr. Bennett Brown, regarding wind power as a  
possible substitute for Quad Cities Units 1 and 2, is provided in Attachment 1. Mr. Brown's  
comments were offered at the NRC's public comment hearing held on December 16, 2003.  
His comments begin on page 77, line 6, of the official transcript of those proceedings.

Sincerely,

Attachments

**ATTACHMENT 1**

**Comments in Response to the Statement of Mr. Bennett Brown**

**Regarding Wind Power**

**At the Hearing of December 16, 2003**

Attachment I

Comments of MidAmerican Energy Company

By Thomas J. Budler, Wind Project Manager

Below are the comments of MidAmerican Energy Company in response to Mr. Bennett Brown's characterization of wind power beginning on page 77, line 6 of the official transcript of proceedings of the Nuclear Regulatory Commission, on December 16, 2003, concerning Exelon Generation Company's application for license renewal for Quad Cities Nuclear Power Station ("QCNP"). MidAmerican possesses a 25% ownership share in QCNP. MidAmerican is also currently developing a 310 MW wind generation project in Iowa, and is a participant in existing wind generation projects as well.

- QC11-1 As an overall comment, MidAmerican would note that it is not opposed to wind-generated power as evidenced by our past and present participation in wind generation projects. However, MidAmerican sees wind-powered generation as a complement to, and not a viable substitute for, base load nuclear generation already in existence.
- In his comments, Mr. Brown attempts to refute the four arguments against utilizing wind power that were advanced in the Plant Specific Environmental Impact Statement ("SEIS"). In summary, the four points Mr. Brown states he is refuting are as follows: (1) That the potential for wind power development, in Illinois, to replace QCNP, is only "marginally present;" (2) That it is "enormously expensive" to develop wind resources; (3) That the land required for development of wind resources is "significant;" and (4) That wind-powered generation can provide only "intermittent power." MidAmerican addresses Mr. Brown's comments on each of these points, below.
- QC11-2 1. Availability of Sufficient Wind Resources. The wind power capacity that would be necessary to replace the QCNP is not available in Illinois. Mr. Brown recognizes that in his testimony, at pages 78-79 of the above-mentioned transcript, where he also touts Iowa as the location for substitute capacity. The SEIS noted that a capacity of 4,200 megawatts would be necessary to replace the capacity of QCNP. In fact, the necessary capacity would probably be even greater. MidAmerican's experience has shown that MAPP, the NERC reliability council with which MidAmerican's wind generation is accredited, actually credits wind capacity at approximately 17% of rated nameplate. This means that to replace the generating capacity of the QCNP some 10,729 megawatts of wind generation would actually have to be installed.
- QC11-3 Mr. Brown also notes, at page 77 of the transcript, that 4,200 megawatts of wind generation would be about 1,000 megawatts of consistent power production throughout the year. In fact, during MidAmerican's research for development of its Iowa Wind Power Project, the Company discovered historical wind resource records showing that for approximately 10% of the available operating time there would be insufficient wind to produce any wind generation at all. Moreover, these historical records show that for approximately 37% of available operating time the wind generating facilities would be generating at less than 25% of

nameplate capacity. Therefore, for nearly 50% of the available operating time, a wind facility in Iowa would likely be operating at less than 25% of its rated capacity.

- QC11-4 2. Costs of Wind Power. Mr. Brown notes that the NRC documents mention it is enormously expensive to develop wind resources. (Transcript, pp. 79 – 81) Mr. Brown attempts to refute this statement with second-hand information from an electric co-op representative who states that the co-op's wind generation production cost is 2.0 to 2.5 cents/kWh. MidAmerican's knowledge of the wind industry would suggest that approximately 5.0 cents/kWh is the more commonly accepted production cost figure for wind generation. That cost can be reduced through use of government subsidies (e.g., the federal Production Tax Credit and CO<sub>2</sub> credits), however, it is important to note that the federal Production Tax Credit expired on December 31, 2003, and has not yet been renewed by Congress. The federal Production Tax Credit is currently valued at 1.8 cent/kWh and the value of CO<sub>2</sub> credits is currently estimated at 0.4 cents/kWh, though there is still not a mature market for trading CO<sub>2</sub> credits.
- QC11-5 In contrast, MidAmerican's existing coal units generate at an average cost of 2.1 cents/kWh, existing nuclear units generate at a cost of 2.7 cents/kWh, and combined cycle units generate at approximately 6.0 cents/kWh. However, it should be noted that all of these units are counted as reliable and dispatchable<sup>1</sup> for capacity during system peak. It should be noted that wind generation is neither reliable nor dispatchable in any given specific time of need for capacity or generation.
- QC11-6 Mr. Brown asserts that it is inappropriate to compare the cost of wind generation with generation based on other fuels. MidAmerican would agree that wind generation cannot be compared to other dispatchable generation since wind is not dispatchable based on system load. Wind generation is only dispatchable when the wind resource is available. However, with the above-noted subsidies, and to the extent that wind is available, MidAmerican's wind facilities will displace all other generating units in the dispatch order. This utilization makes wind generation a very important part of MidAmerican's overall generation portfolio.
- QC11-7 In his cost discussion, Mr. Brown also ignores the significant cost of transmission system impacts. (Mr. Brown appears to assert that his 2.0 to 2.5 cents/kWh does include outlet transmission costs, but then apparently ignores the costs of transmission system impacts.) As a member of MAPP, MidAmerican is required to meet MAPP's reliability criteria. A requirement of MAPP is that the transmission system must be sufficient such that the generation is able to deliver rated output for certain system conditions. As discussed in number 1, above, this means the transmission system would have to be upgraded sufficiently to address all impacts for the additional 10,729 megawatts of nameplate wind generation.

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<sup>1</sup> "Dispatchable" as used herein means the ability to control generation output to match load and economics requirements.

This could be a very significant cost when taken in consideration with a wind project location and existing transmission system constraints.

- QC11-8      3. Land Requirements for Wind Generation. Mr. Brown also comments (Transcript, pp. 81-82) on the NRC document noting the land use for a wind facility would be significant. Mr. Brown states that a two megawatt turbine required only a quarter of an acre of actual land use and that farmers are still able to utilize much of their land. This in fact is fairly consistent with what MidAmerican has seen with its wind project development. What Mr. Brown fails to account for is the necessary spacing for capture of the wind resource. Wind turbines must be sufficiently spaced apart to maximize capture of the available wind energy. If the turbines are too close together one turbine can impact the efficiency of another turbine. Based on MidAmerican's experience the appropriate spacing of wind turbines equates to approximately 72 acres per megawatt. This would mean the project footprint for 10,729 megawatts would entail over 772,000 acres. This is a more significant number than that cited by Mr. Brown.
- QC11-9      4. Intermittent Power. Mr. Brown notes (Transcript, pp. 82-84) that the SEIS discusses the intermittent nature of wind. The lack of wind energy dispatchability is discussed in number one, above. Mr. Brown also discusses the short- and medium-term fluctuations in wind generation, noting that a penetration of 25% is viable with no change to the transmission grid. MidAmerican plans to install 310 MW of wind generation in the next three years, in Iowa. As of May 2003, this 310 MW represents approximately 7% of MidAmerican's nameplate generation. Transmission system impact studies note nineteen separate upgrades necessary to accommodate this generation. There would likely need to be significant changes and related investments in the transmission grid to accommodate an additional 18% penetration. To say that no changes would be required in the transmission grid and that Iowa could very easily accommodate a 25% penetration of wind energy is clearly not correct.

In his own discussion, Mr. Brown is not clear whether the 25% penetration he notes is nameplate capacity or actual generation. He does go on to discuss the need to increase generation capacity during peak periods. This is also the same discussion noted in number 1, above. As such, existing MAPP requirements would necessitate the building of 10,729 megawatts of wind generation to cover this peak capacity need.

Respectfully submitted by: Thomas J. Budler  
 Wind Project Manager  
 MidAmerican Energy Company  
 4299 Northwest Urbandale Drive  
 Urbandale, Iowa 50322  
 Phone: (515) 252-6500  
 Email: [tjbudler@midamerican.com](mailto:tjbudler@midamerican.com)

Appendix A

Received: from igate.nrc.gov  
by nrcgwia.nrc.gov; Tue, 27 Jan 2004 17:36:25 -0500  
Received: from hotmail.com (bay2-f90.bay2.hotmail.com [65.54.247.90])  
by smtp-gateway ESMTP id i0RMa2db003004  
for <QuadCitiesEIS@nrc.gov>; Tue, 27 Jan 2004 17:36:02 -0500 (EST)  
Received: from mail pickup service by hotmail.com with Microsoft SMTPSVC;  
Tue, 27 Jan 2004 14:36:18 -0800  
Received: from 208.248.158.89 by by2fd.bay2.hotmail.msn.com with HTTP;  
Tue, 27 Jan 2004 22:36:18 GMT  
X-Originating-IP: [208.248.158.89]  
X-Originating-Email: [wntrlark@hotmail.com]  
X-Sender: wntrlark@hotmail.com  
From: "Leslie Perrigo" <wntrlark@hotmail.com>  
To: QuadCitiesEIS@nrc.gov  
Subject: QCNPS comments  
Date: Tue, 27 Jan 2004 22:36:18 +0000  
Mime-Version: 1.0  
Content-Type: text/html  
Message-ID: <BAY2-F90khJnctTwQ190000b1ad@hotmail.com>  
X-OriginalArrivalTime: 27 Jan 2004 22:36:18.0658 (UTC) FILETIME=[FB254420:01C3E525]  
X-MIME-Autoconverted: from 8bit to quoted-printable by igate.nrc.gov id i0RMa2db003004

Attention: Duke Wheeler!

QC12-1

Although the final decision may not be made until June of this year, the license renewal of the QCNPS is an issue of grave significance to every resident of the Quad Cities and surrounding area. The plant at Cordova is one of twenty-one nuclear power plants along the Mississippi River watershed, and one of the oldest Boiling Water Reactors in the nation. The inherent design flaws of this model pose a serious threat to not only members of the Quad Cities, but all those down stream from us. Typical discharge points for gaseous and liquid releases to air, water and soil from nuclear power plants include planned releases from the reactor's routine operation and unplanned releases from leaks and accidents. The design of the Torus containment system employed by GE Mark 1 Boiling Water Reactors increases the risk of releases to the environment by venting any high pressure buildup of radioactive steam generated during an accident directly to the atmosphere through the 300 foot stack, UNfiltered.

QC12-2  
QC12-3

A report published by the NRC in 1993 confirmed that age-related degradation will damage or destroy many vital safety-related components inside the reactor vessel before the 40 year license expires. We cannot afford to put the Quad Cities and our neighbors downstream at risk. It is time to seek serious solutions to solve our energy needs. Iowa and Illinois have a monumental

QC12-4

opportunity to set an example for the rest of the country and help our great nation claim its energy independence. Investing in renewable energy today could create thousands of new jobs and stimulate the local economy. Efficiency is a viable alternative that could actually eliminate the need for over 127 power plants by 2010. And it does not take mass amounts of money, create toxic waste, or pollute the environment for thousands of years.

Also of concern to me is the draft supplement's blatant misrepresentation of alternative technologies. The investigators obviously made little effort to seriously work out the details of illeget technologies which they illegetly deemed unfeasible, too costly or needing too much space. Solar and geothermal alternatives are generally incorporated into existing structures, and wind turbines can share the field with crops, with farmers harvesting up to within 1 foot of the turbine tower. As a board member of the Iowa Renewable Energy Association, I know whereof I speak. I believe you have heard the same from Bennett Brown as well. So please, before you discount the benefits of renewable alternatives AND efficiency, I implore you to undergo an independent study of viable alternatives for the Quad Cities.

Respectfully,

QC12-5

Leslie Perrigo, Davenport, IA

563-445-0369

PS- The following text is a copy of my summation from the afternoon session at the Mark in December, which I had told members of the NRC I would get to them. I was told that these were more "security issues," yet the security of the plant and its aging components has direct bearing on the surrounding environment, and its neighbors downstream. Please encourage your counterparts to take these issues seriously in that they affect us in the Quad Cities, and the Mississippi River watershed immediately. Thanks.

Leslie Perrigo for IECAN

There are a couple of issues which I feel need to be addressed as they are legitimate concerns that relate directly to the health, safety and general well being of the environment surrounding the Quad Cities Nuclear Power Station.

Regarding plant performance; failure to comply with NRC procedures and complete basic routine maintenance on schedule has incurred preliminary wear and irreversible damage to vital reactor components. Increasing the possibility of mechanical failure and the likelihood of a major accident.

In June of 1996 a fine of \$100,000 was proposed against the utility for failing to correct design deficiencies for components in one of the plant's emergency core cooling systems. Modifications to pipe supports and structural steel in the 1980's had resulted in additional loads on the steel beams- in some cases exceeding those permitted in the original plant design. These deficiencies were

## Appendix A

not corrected until 1996.

In June of 1997 a fine of \$50,000 was proposed for deferring repairs to the interior and exterior siding of the reactor building at QCNPS. Both interior and exterior siding are needed for the reactor building to fill its design function of containment.

In 1998 the NRC proposed fines in excess of \$450,000 for failure to implement an adequate program for monitoring maintenance; failure to develop adequate procedures and systems to safely shut down the QCNPS, and for performing a pressure test of the Unit 2 reactor vessel and piping AFTER the reactor had started up INSTEAD of BEFORE the reactor startup in order to detect any leaks in the reactor vessel and piping.

Between June of 1999 and September of 2002 the utility neglected to correct multiple switch failures which impacted the availability, reliability and (2min) capability of equipment used to respond to initiating events and prevent undesirable consequences from a plant fire.

In March 2003 the NRC staff identified a number of human performance issues, including damage to a control drive pump due to improper setting of a lubricating device; failure to recognize that the Unit 2 shut down cooling system was inoperable for several MONTHS and several instances of valves placed in the wrong position.

These are but a few of the events which have increased the amount of undue stress on reactor components and accelerated the aging process. The NRC has confirmed that age-related degradation in BWRs will damage or destroy vital internal components well BEFORE the standard 40 year license expires, yet the readiness of the industry to meet projected maintenance and repair challenges is unclear. For some components, methodologies are still in the conceptual phase of development (12 of 29 in 1994).

The core shroud is one (3min) of many safety-related components that may be damaged or destroyed by age-related degradation in BWRs. A German utility operating a GE Mark 1 BWR (like QC 1 2) where extensive core shroud cracking was found estimated the cost of replacement at \$65 million. Germany's oldest BWR was closed in 1995 after wary German nuclear regulators rejected a plan to repair rather than replace the reactor's cracked core shroud. Extensive core shroud cracking was discovered at QC Unit 1 in 1994.

Reactor aging will require a major continuous effort by industry officials to anticipate emerging age-related problems and resolve them before they become a crisis. By dealing with the whole problem of age-related degradation NOW, federal and state regulators can ensure future safety and engineering



Implications of multiple component failures in BWRs.

Lastly, the continued operation of any General Electric Mark 1 BWR relies upon a nuclear waste cooling and storage pond that is elevated 6-10 stories up in the reactor's secondary containment building, and does not appear to have any significant structure to reduce the likelihood of penetration by deliberate attack. Only 4 of the 103 operating reactors have design features intended to resist aircraft impact: Limerick 1 & 2 and Seabrook reactors- 6 ton, Three Mile Island Unit 1- 90 ton. No other US reactor was designed to withstand aircraft impact.  
5.1.1 35-39

The identified structural vulnerability of the Mark 1 irradiated fuel storage and cooling ponds constitutes an unreviewed safety issue. Attack on a reactor could lead to rapid onset core melt with open containment and a raging fire. An NRC study concluded that a generic estimate of 100% of the radioactive isotope Cesium-137 would be released in the event of a spent fuel pool fire. A full spent fuel pool contains 74 million curies of Cesium-137.

Defense of US nuclear facilities should be seen as a key component to Homeland Security. As such, spent fuel pools should be re-equipped with low density racks, and all other spent fuel should be hardened and dispersed throughout the site to make it a less attractive target.

In conclusion, I would just like to point out that the useful lifetime of a nuclear power plant is 25 years in actual practice. It is becoming abundantly clear that aging of reactor components poses serious economic and safety risks at BWRs. The GE Mark 1 in particular has significant inherent design flaws and lacks containment integrity during a nuclear accident. Under the circumstances, it would be prudent to retire the QCNPS in 2012, and seek out safer, more financially viable options for the community. Thank you.

TO The Honorable Duke Wheeler,  
Chief Rules & Directive Branch - NRC

11/13/03  
65 FR 64372

**Please protect the Mississippi River Watershed for future generations, and give our states the opportunity to develop more viable energy solutions for our communities.**

11

Dear Duke,

Thank you for taking the time to consider public opinion. Enclosed you will find a petition that 153 people have signed, asking the NRC to retire the plant. I've also included 4 sign on letters from other non-profits, and an article on nuclear security. Please call me if you have any questions.

Sincerely,

Leslie Ferrigo  
Leslie Ferrigo, IECAN

RECEIVED  
2004 FEB -3 PM 3:31  
Rules and Directives  
Branch  
USNRC

Template = ADM-013

F-RTDS = ADM-03  
Call - D. Wheeler (Dir)

**Petition to the Nuclear Regulatory Commission in Opposition  
of the License Renewal of the Quad Cities Nuclear Power Station  
Presented by the Independent Environmental Conservation & Activism Network**

**We, the undersigned, strongly oppose the license renewal of the Quad Cities Nuclear Power Station, and urge the Nuclear Regulatory Commission to (SAFSTOR) decommission the plant, following the expiration of its original operating license.**

QC13-1

At the meeting held April 8th at the Mark of the Quad Cities in Moline, T.J. Kim of the Nuclear Regulatory Commission (NRC) explained that the initial licensing period of 40 years was based more on economic factors than safety or technical specifications. This plant in particular has a rich history of poor routine maintenance; testing violations, equipment failure, security weakness, inoperable safety systems, and human performance errors. In light of these events, it is neither safe nor cost effective for the community, to continue to operate these reactors beyond their original lifespan.

**Background**

The Quad City Nuclear Power Station (QCNPS) was completed and ready for operation in 1972, one of six stations owned and operated by Commonwealth Edison Company. The two-unit station occupies 784 acres on the east bank of the Mississippi River, with a net electrical output of 789 megawatts per unit.

In 2001, Unicom, the parent company of Commonwealth Edison, merged with PECO Energy and formed a parent entity- Exelon Corporation. The ownership and operation of Commonwealth Edison's 10 operating nuclear power plants and 3 retired nuclear plants was then transferred to Exelon.

Later that year, Exelon submitted a request to the NRC for changes to the operating licenses and Technical Specifications for Dresden Nuclear Power Station (DNPS) and QCNPS, to allow operation at uprated power levels. The NRC approved this request. The Safety Evaluation accompanying the approval amendment required that Exelon confirm to the NRC that necessary modifications to the main steam and torus-attached piping systems were completed prior to the implementation of the power uprate.

The power uprate at Quad Cities 1 and 2 will increase the power of each reactor by 17.8%, to about 912 megawatts of electricity per unit. Modifications were completed prior to implementation of the uprate for QCPS Unit 2 during the refueling outage that ended on March 5, 2002. The piping system modifications for QCNPS Unit 1 were completed during the refueling outages in fall of 2002.

Currently the Quad Cities area gets 23.6% of its total commercial power from nuclear energy. Although much of it comes from the QCNPS, some is subcontracted from a similar plant in Nebraska.

**Significant Events**

**September 8, 1987**

On May 1, 1987, Commonwealth Edison Company (CECO), the existence of a gap in the Quad Cities neutron absorber panel has been confirmed by underwater neutron radiography conducted by Nusurtec, Inc. The racks that store the spent fuel are made with boron and

QC13-2

carbon so that they absorb neutrons created as the spent fuel continues to decay. There were gaps between panels of the racks, which were created by radiation damage to the storage racks, and presumably would have worsened had they not been noticed. Had the gaps gotten larger, they could have allowed enough neutrons to pass from one spent fuel rod to another. The fuel pond would have gone critical- meaning that the chain reaction used to boil water inside the reactor would have boiled the water in the cooling pond. The concern is that separation of the neutron-absorbing material used in high density fuel storage racks might compromise safety.

**August 16, 1993**

Ruptured discs burst, releasing steam into the HPCI room, burning, and slightly contaminating, five workers. The ruptured discs burst within one second after the turbine was started. Fire doors between the Unit 1 and Unit 2 HPCI rooms were blown off their hinges into the Unit 2 HPCI room. Upon investigating the event, the licensee determined that water had accumulated in the turbine casing because the drain system level switches for the Unit 1 HPCI system had failed. In April 1992, the licensee performed a reliability-centered maintenance study, which recommended the level switches be included in the preventive maintenance program but the recommendation had not been acted on at the time of the event. Failure to complete the recommended maintenance eventually impacted the outer disc as designed and caused it to burst as well. The exhaust line pressure sensors did not detect a high pressure and should have immediately isolated the steam supply upon sensing a high exhaust pressure before the rupture discs burst. The steam injured five workers, four of whom were participating in the HPCI pump surveillance test. The fifth, and most severely injured worker was a health physics technician in the room on routine rounds, who was not aware of the danger posed by the surveillance test. The test procedure contained no specific guidance on room occupancy. The HPCI and RCIC rupture discs at Quad Cities Station had been in service for 20 years and were not part of any scheduled inspection or preventive maintenance program.

**July 25, 1994**

The NRC issued a generic letter to all holders of operating licenses or construction permits for boiling water reactors (BWRs) except for Big Rock Point, which does not have a core shroud. Intergranular stress corrosion cracking (IGSCC) of BWR internal components had been identified as a technical issue of concern by both the NRC staff and the industry. Inspection findings caused the NRC staff and industry to re-evaluate the significance of this issue, due to the extent of 360 degree cracking, and the location at a lower elevation where extensive cracking had been found at Dresden Unit 3 and Quad Cities Unit 1 on July 19, 1994. In addition to the core shroud, NRC has an overall concern with cracking of BWR internals and encourages licensees to work closely with the BWR Owners Group (BWROG) on coordination of inspections, evaluations and repair options for internals cracking.

**May 10, 1996**

An alert was declared for the Quad Cities Units 1 and 2, due to high winds and a possible tornado in the area. Unit 1 was completing a refueling outage and Unit 2 was operating at 100% power. About 25% of the outer layer of sheet metal was blown from the east side of the reactor building. The sheet metal ruptured an N2 line that feeds nitrogen from the tank farm to the containment for the containment purge and damaged cabling from the Station Blackout diesel. 27 Area sirens lost power, data from the meteorology tower was interrupted, the oil storage building was destroyed, spilling about 15 gallons of uncontaminated oil, and the roof of the mixed waste building was damaged.

**June 14, 1996**

The NRC proposed a \$100,000 fine against Commonwealth Edison after the utility failed to promptly correct design deficiencies in structural steel beams and supports for components in one of the plant's emergency core cooling systems. The utility's architect-engineer determined

that modifications to pipe supports and structural steel in the 1980's had not been evaluated to determine their effect on seismic design criteria. The modifications resulted in additional loads on the steel beams and supports which, in some cases, exceeded those permitted in the original plant design. These deficiencies were not corrected until February 1996 at Quad Cities and until March 1996 for Dresden Unit 2. Commonwealth Edison personnel were aware of the design deficiency for over five years without effective resolution.

**June 26, 1997**

The NRC proposed a \$50,000 fine against Commonwealth Edison for deferring repairs to the interior and exterior siding of the reactor building at the Quad Cities Nuclear Power Station. Both the interior and exterior siding are needed for the reactor building to fill its design function of containing radioactive releases in the unlikely event of a reactor accident. The siding also includes "blow out" panels that are designed to relieve pressure inside the reactor building should there be a steam release that could potentially damage the building's structure. In notifying the utility of the proposed fine, NRC Regional Administrator A. Bill Beach said, "These violations are significant because your staff failed to translate the design into surveillance tests to ensure the structure remained operable."

**September 1997**

The owner of the Quad Cities nuclear plant in Illinois informed the NRC that a fire could cut off the power to ALL of the emergency pumps and cause serious reactor core damage. Following the disastrous fire at the Browns Ferry nuclear plant in March 1975, the NRC required all owners to modify their plants to ensure that a fire could not interrupt the power to both the primary emergency pumps and their backups. More than 22 years later, the Quad Cities plant was still vulnerable. It took the plant's owners nearly a year to re-route power cables and revise emergency procedures to remedy the problems.

**March 4, 1998**

The Nuclear Regulatory Commission staff has proposed a \$55,000 fine against Commonwealth Edison Company for 18 violations involving the failure to implement an adequate program for monitoring the effectiveness of maintenance done on plant systems and equipment at the Quad Cities plant. In two instances, the utility took no action after it became clear that the type of preventive maintenance being performed on systems and equipment was not effective in preventing a functional failure. It was only after NRC inspectors identified the extensiveness of the deficiencies, that aggressive, substantive actions were implemented.

**March 13, 1998**

The NRC proposed a \$330,000 fine against Commonwealth Edison for performing a pressure test of the Unit 2 reactor vessel and piping on June 22 of last year after the reactor had started up, rather than prior to startup. This test is required by the NRC to be performed before the reactor startup to detect any leakage from the reactor vessel and associated piping. The plant staff also failed to adequately perform required monitoring of the reactor vessel and piping as part of the test. Similar monitoring violations were identified for earlier tests at both of the Quad Cities units.

**September 15, 1998**

The NRC proposed an \$88,000 fine against Commonwealth Edison Company for failing to develop adequate procedures and systems to safely shut down the Quad Cities Nuclear Power Station under certain fire conditions. NRC Acting Regional Administrator James Caldwell said, "These violations represent a very significant safety concern because they involve inadequacies in Commonwealth Edison's ability to shut down the Quad Cities facility following a postulated fire." Both reactors remained shut down until May of this year for improvements to plant safety systems and procedures for use in the event of a fire. In addition to the inadequacies in the shutdown procedures, the NRC staff also cited Commonwealth Edison for initially changing its procedures to rely on an additional diesel generator without doing the necessary safety reviews.

**February 24, 1999**

During the switch over the licensee inadvertently failed to close the "A" RHR minimum flow valve as required by the procedure. Sometime later operators noted a decreasing reactor water level. On the basis of post event reviews, it appears that the minimum flow valve in the "A" loop was left open because the nuclear station operator failed to ensure that the tasks were performed in the sequence specified in the operating procedures. The operating crew did not recognize that there was any problem until approximately 10 minutes had passed and the water level had decreased about 13 inches because of a misinterpretation of causes of the level decrease. After detecting the decrease, the operating crew was slow to react, which allowed the level to decrease another 20 inches before the operators isolated shutdown cooling, which terminated the draindown. Operations staff practices including poor communications, poor activity briefings for high-risk activities, lack of effective pre-shift briefings, inadequate supervision of important control room activities, inadequate monitoring of control room panels, and slow event response may have contributed to the event.

**May 8, 2001**

NRC force-on-force tests of security preparedness at nuclear power plants resumed, which pit a handful of simulated intruders against a plant's physical defenses and squadrons of armed security personnel. In 1998, these tests had revealed significant security weaknesses in about 47 percent of the plants tested. The NRC quietly discontinued the testing, but the ensuing public outrage forced the agency to re-institute the tests. Since the tests have been resumed, about 47 percent of the plants continue to have significant security flaws revealed. In 2000, force-on-force tests at the Waterford plant in Louisiana and the Quad Cities plant in Illinois demonstrated serious security problems that warranted extensive repairs and upgrades. The owner of the Waterford spent more than \$2 million fixing its inadequate security system.

**December 11, 2001**

While performing calculations associated with the power uprate project, Quad Cities Nuclear Power Station determined that the Standby Liquid Control (SLC) system relief valves on Unit 1 and Unit 2 may intermittently lift during the most limiting transients. The specific scenario evaluated is a Main Steam Line Isolation at rated power with failure of the normal, backup, and alternate rod insertion scram functions. This issue also applies to the current rated power level during two-pump SLC operation. While the relief valve was lifted, the system flow rate would not meet the required equivalent flow rate into the vessel. Therefore, this condition was not in direct compliance with 10 CFR 50.62.

**September 30, 2002**

The licensee failed to follow procedural requirements regarding the initiation of condition reports and determining the extent of condition following the discovery of a large amount of grease in the 1A core spray room cooler motor. As a result, the licensee did not provide a basis for continued operability of potentially impacted plant motors for approximately 40 days.

Ineffective corrective actions resulted in repetitive failures of the 2A residual heat removal normal/alternate switch between June 1999 and September 2002 and a Non-Cited Violation of 10 CFR 50. The failure to correct the multiple normal/alternate switch failures was more than minor because the switch failures impacted the availability, reliability, and capability of equipment used to respond to initiating events and prevent undesirable consequences from a plant fire.

**March 26, 2003**

A letter from the NRC to Exelon Nuclear addresses plant safety performance during the previous

year and states that the NRC staff "has identified a substantive cross-cutting issue in the area of human performance involving a number of findings." Some of the examples include the damage to a control drive pump due to improper setting of a lubricating device, a failure to recognize that the Unit 2 shut down cooling system was inoperable for several months and instances of valves placed in the wrong position.

April 16, 2003

An emergency alert was declared due to a stuck open [power operated] relief valve. The problem occurred when the large tank of emergency cooling water- known as the torus- was rapidly heating above the maximum 110-degree limit the torus was designed to handle. The temperature increase was due to steam leaking through an open valve in the reactor. Efforts to shut the valve were unsuccessful, which led to the emergency.

The torus was originally designed to absorb the heat energy produced in an accident to prevent the primary containment building from exploding, as the reactor at Chernobyl did in 1986. After Mark I reactors had been operating for five years, measurements indicated that the torus water would heat up too quickly and reach boiling temperatures. If this happened, the resulting pressure would cause the torus to explode and release radioactivity from the core into the environment. In 1986, the NRC's top safety official testified that, if called upon to contain an accident, the torus had a 90% likelihood of failure. To prevent such an explosion, two holes were drilled into the torus, and ducts were installed from the torus to the power plant's 300-foot emissions stack.

This "direct torus venting system" put an end to the hope that an accident could be contained, but would at least, in many scenarios, prevent the containment buildings from exploding.

The power plant was shutdown before radioactive gases were released into the atmosphere, and the plant will be able to return to normal operations. The event will however have implications for the future of the Quad Cities plant. Each SCRAM is hard on a nuclear power plant's safety equipment because of the sudden changes in temperature and because the force of inserting the control rods into the core exerts a pulse of high pressure on valves, tubes, and gaskets. Each SCRAM ages the components of a nuclear power plant. The flaw in the torus design, and the dangerous solution intended to get the plants through their 40-year license, call into question whether the licenses for flawed nuclear plants should be renewed.

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May 20, 2003

The plant was shut down due to reactor coolant boundary leakage. The Unit One Reactor Coolant System was determined to have Pressure Boundary Leakage. The Unit was in the process of shutting down for a maintenance outage, and sub critical at the time. The leakage was found during a Drywell inspection as part of the shutdown.

June 2003

The NRC began a special inspection at the Quad Cities Nuclear Power Station to review damage to a pump which led to the shutdown of the Unit 1 reactor on January 9, 2003. When a brace holding the jet pump in position broke, causing portions of the pump to separate, reactor operators promptly began to shut down the reactor to investigate the problem. Reactor cooling was maintained without the need for backup or emergency cooling systems.

QC13-4

We believe that these incidents constitute legitimate concerns that relate directly to the health, safety and general well being of the surrounding population. These events characterize a blatant disregard for the NRC's own policies, and the people and environment which they are intended to protect; and present unwarranted risks to public health, safety and general well being.

- QC13-5 •Energy efficiency is the quickest, cheapest, easiest way to achieve energy independence. Adopting the household appliance efficiency standards agreed to by both the Clinton and Bush (senior) administrations would eliminate the need for 127 power plants by 2020.
- QC13-6 •Failure to comply with NRC procedures and complete basic routine maintenance on schedule has incurred preliminary wear and irreversible damage to vital reactor components, increasing the possibility of mechanical failure and the likelihood of a major accident.
- QC13-7 •Since containment buildings were not designed to withstand attacks by aircraft, there is an inherent possibility that a terrorist attack on a spent fuel pool could contaminate the surrounding environment and do irreversible harm to the Mississippi River watershed.
- QC13-8 •Because there is no known way to dispose of radioactive waste- the byproduct of nuclear facilities, and the Yucca Mountain Repository is not a suitable choice due to flawed science and the potential exposure of millions of people who live, work and play within mere miles of the proposed transport route, it would be prudent to reduce the amount of waste BEING GENERATED until a viable solution is discovered.
- QC13-9 •There are numerous alternatives to nuclear power which are renewable; do not pollute like coal or diesel, and do not produce thousands of tons of radioactive waste which we have no feasible means to dispose of. These clean, abundant technologies have a real potential to create new job markets, boost the economy and improve the environment.
- QC13-10 Furthermore, it is unacceptable to expect ratepayers and Illinois residents, through their taxes, to continue to support a decrepit power plant that does not benefit its investors due to the many inevitable repairs which accompany the extension of an operating license.
- As it stands, Exelon has submitted an appeal for a reduction of the stations taxable value, which would have a devastating effect upon the local taxing districts, and deprive the county of over \$400,000. The college will lose over a quarter million, resulting in substantial layoffs and the corresponding reduction of social services. The school district will lose more than \$2 million- nearly 29 percent of its entire budgeted revenues.

**Conclusion**

- QC13-11 The useful lifetime of a nuclear power plant is approximately 25 years, in actual practice. Materials have a fixed number of cycles of strain they can bear before they begin to crack and fail. Due to radiation induced within their originally non-radioactive components, reactors and other major nuclear facilities may become dangerous to operate- or even approach- long BEFORE they show signs of physical deterioration.
- QC13-12 The Quad Cities units are members of an aging fleet of Boiling Water Reactors (BWR), engineered long before terrorism was even a consideration. In addition to the physical and chemical processes, which accelerate aging degradation of the systems, structures and components- such as corrosion, embrittlement, fabrication defects, vibration, water hammer and wear- there is also the concern of structural vulnerability. None of the 103 nuclear power plants operating in the United States were designed to withstand suicide attacks from the air, such as we tragically experienced on September 11, 2001.
- QC13-13 Currently, nuclear waste, or spent fuel, is kept in high-density pools six to ten stories up in the reactor's secondary containment building. The pools share a common wall with an exterior wall of the building, and do not appear to have any structural reinforcement to prevent the likelihood of penetration by deliberate attack. Attack on a reactor could lead to rapid onset core melt with an open containment, accompanied by a raging fire. Due to high radiation fields across the site, access to the site by personnel would be precluded.

A full spent fuel pool contains 74 million curies of the radioactive isotope Cesium-137. An NRC



study concluded that a generic estimate of the release of Cesium isotopes during a spent fuel pool fire is 100%. Cesium-137 accounts for most of the off-site radiation attributed to Chernobyl and has a half-life of 30 years. Cesium-137 would be released into the atmosphere in small particles, and deposited on the ground and other surfaces. These particles would then emit intense gamma radiation, leading to whole-body radiation doses to exposed persons. Cesium-137 would also contaminate water and food sources.


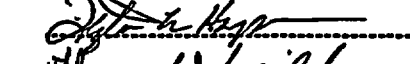


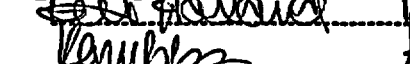
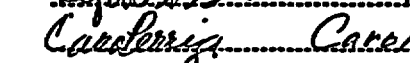
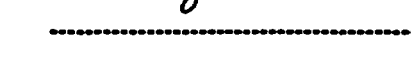

- QC13-14 Even with the highest NRC rating or upgrades, nuclear plants are not invincible. They can approach near-meltdown conditions through mechanical failure alone, without any security breach from outside. The Project on Government Oversight found that nuclear plants in general still remain ill equipped, under-staffed, and under-trained. Public assurances by the NRC do little to dispel this impression.
- QC13-15 Nuclear power plants present many complications and risks to our health, environment and economy, which are unique to this form of energy. Although emissions from nuclear plants are significantly lower than emissions from fossil fuels, carbon is emitted at every step of the nuclear fuel chain. The overall inherent dangers of radiation far outweigh the benefits of nuclear power.
- QC13-16
- QC13-17 The Quad Cities Nuclear Power Station has outlived its purpose. We, the people, demand responsible energy solutions. Options, which can increase efficiency, meet our needs, create new jobs, and stimulate the local economy. A license renewal for the QCNPS offers little more than higher utility bills, further environmental degradation and greater potential for a nuclear disaster.
- QC13-18
- QC13-19 We urge you to deny Exelon's request for an extension of their operating license for Quad Cities Units 1 and 2, and give us the opportunity to develop alternative energy sources that are renewable, do not pollute like coal or diesel, and do not generate dangerous toxic waste which we have no feasible means to dispose of.

Sincerely,

Signature

Printed Name

Address

	Jesse J. Oiler	320 Brady St <sup>716 52801</sup> Davenport IA
	Leslie A. Hays	320 Brady St <sup>Apt 52801</sup> Davenport IA
	Theresa L. Schofield	106 E. 3rd <sup>#508 Davenport IA</sup> 52801
	Patty Ksolik	423 W. 8th St. Davenport, IA 52801
	Michael W. Kirschbaum	106 E. 3rd <sup>52801</sup> Apt. 908 Davenport IA
	Beth Holland	6039 Bluff Rd Princeton IA 52768
	Kelly Ambros	1825 W 40th Davenport IA 52806
	Carol Perrigo	1825 W 40th Davenport IA 52806

**Petition to the Nuclear Regulatory Commission In Opposition  
of the License Renewal of the Quad Cities Nuclear Power Station  
Presented by the Independent Environmental Conservation & Activism Network**

**We, the undersigned, strongly oppose the license renewal of the Quad Cities Nuclear Power Station, and urge the Nuclear Regulatory Commission to (SAFSTOR) decommission the plant, following the expiration of its original operating license.**

At the meeting held April 8th at the Mark of the Quad Cities in Moline, T.J. Kim of the Nuclear Regulatory Commission (NRC) explained that the initial licensing period of 40 years was based more on economic factors than safety or technical specifications. This plant in particular has a rich history of poor routine maintenance; testing violations, equipment failure, security weakness, inoperable safety systems, and human performance errors. In light of these events, it is neither safe nor cost effective for the community, to continue to operate these reactors beyond their original lifespan.

**Background**

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*Currently the Quad Cities area gets 23.6% of its total commercial power from nuclear energy. Although much of it comes from the QCNPS, some is subcontracted from a similar plant in Nebraska.*

We believe that these are legitimate concerns relating directly to the health, safety and general well being of the surrounding population. These events characterize a blatant disregard for the NRC's own policies, and the people and environment which they are intended to protect; and present unwarranted risks to public health, safety and general well being.

- Energy efficiency is the quickest, cheapest, easiest way to achieve energy independence. Adopting the household appliance efficiency standards agreed to by both the Clinton and Bush (senior) administrations would eliminate the need for 127 power plants by 2020.
- Failure to comply with NRC procedures and complete basic routine maintenance on schedule has incurred preliminary wear and irreversible damage to vital reactor components, increasing the possibility of mechanical failure and the likelihood of a major accident.

- Since containment buildings were not designed to withstand attacks by aircraft, there is an inherent possibility that a terrorist attack on a spent fuel pool could contaminate the surrounding environment and do irreversible harm to the Mississippi River watershed.
- Because there is no known way to dispose of radioactive waste- the byproduct of nuclear facilities, and the Yucca Mountain Repository is not a suitable choice due to flawed science and the potential exposure of millions of people who live, work and play within mere miles of the proposed transport route, it would be prudent to reduce the amount of waste BEING GENERATED until a viable solution is discovered.
- There are numerous alternatives to nuclear power which are renewable; do not pollute like coal or diesel, and do not produce thousands of tons of radioactive waste which we have no feasible means to dispose of. These clean, abundant technologies have a real potential to create new job markets, boost the economy and improve the environment.

Furthermore, it is unacceptable to expect ratepayers and Illinois residents, through their taxes, to continue to support a decrepit power plant that does not benefit its investors due to the many inevitable repairs which accompany the extension of an operating license.

As it stands, Exelon has submitted an appeal for a reduction of the stations taxable value, which would have a devastating effect upon the local taxing districts, and deprive the county of over \$400,000. The college will lose over a quarter million, resulting in substantial layoffs and the corresponding reduction of social services. The school district will lose more than \$2 million- nearly 29 percent of its entire budgeted revenues.

#### Conclusion

The useful lifetime of a nuclear power plant is approximately 25 years, in actual practice. Materials have a fixed number of cycles of strain they can bear before they begin to crack and fail. Due to radiation induced within their originally non-radioactive components, reactors and other major nuclear facilities may become dangerous to operate- or even approach- long BEFORE they show signs of physical deterioration.

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Even with the highest NRC rating or upgrades, nuclear plants are not invincible. They can approach near-meltdown conditions through mechanical failure alone, without any security breach from outside. The Project on Government Oversight found that nuclear plants in general still remain ill equipped, under-staffed, and under-trained. Public assurances by the NRC do little to dispel this impression.

Nuclear power plants present many complications and risks to our health, environment and economy, which are unique to this form of energy. Although emissions from nuclear plants are significantly lower than emissions from fossil fuels, carbon is emitted at every step of the nuclear fuel chain. The overall inherent dangers of radiation far outweigh the benefits of nuclear power.

The Quad Cities Nuclear Power Station has outlived its purpose. We, the people, demand responsible energy solutions. Options, which can increase efficiency, meet our needs, create new jobs, and stimulate

the local economy. A license renewal for the QCNPS offers little more than higher utility bills, further environmental degradation and greater potential for a nuclear disaster.

We urge you to deny Exelon's request for an extension of their operating license for Quad Cities Units 1 and 2, and give us the opportunity to develop alternative energy sources that are renewable, do not pollute like coal or diesel, and do not generate dangerous toxic waste which we have no feasible means to dispose of.

Sincerely,

Name	Signature	Address
BOBBA SALVIN-CHAD	<i>[Signature]</i>	100 Clinton
Margaret Spruill	<i>[Signature]</i>	423 S. Lawrence St. IA 50801
<i>[Signature]</i>	<i>[Signature]</i>	728 College St Iowa City 52242
Dan East	<i>[Signature]</i>	DAN EAST 1608 1/2 310th St Goshen, IN 46526
Ryan Karcher	<i>[Signature]</i>	↑ same
Tom Hartman	<i>[Signature]</i>	1700 S. Main St Goshen, IN 46526
Charles Buell	<i>[Signature]</i>	225 Elizabeth St IA
Tom Hansen	<i>[Signature]</i>	1307 Carroll St Iowa City
Cady Hansen	<i>[Signature]</i>	1307 Carroll St Iowa City
Azure Lee Stein	<i>[Signature]</i>	Po Box 47770 Davenport IA 52808-4771
MARY VOPAVA	<i>[Signature]</i>	Mary E. Vopava 1624 1/2 St. ROCK ISLAND, IL 61201
Hope Aldeman	<i>[Signature]</i>	1120 37th St. Rock Island, IL 61201
<i>[Signature]</i>	<i>[Signature]</i>	1024-10th St Rock Island IL 61201
Staci Hamall	<i>[Signature]</i>	1332-25th St Rock Island IL 61201

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Sincerely,

Signature	Printed Name	Address
<i>Bennett Brown</i>	Bennett Brown	879 Echo Ave, Mechaucerville, IA
<i>Kristen Dolans</i>	KRISTEN DOLANS	2291 S Riverside Dr Tama City IA 52326
<i>Anna Foltyn</i>	ANNA FOLTYN	2608-C Park Blvd Marshalltown IA
<i>Christopher Lohrer</i>	Christopher Lohrer	1075 E Lockstep Ave IA City IA 52745
<i>Chris Thompson</i>	Chris Thompson	320 N. Main St #5, IA City, IA 52715
<i>Ed Ziser</i>	Ed Ziser	289 Elm St, IA City, IA 52715
		P.O. Box 15-74, Grinnell IA 50112

around nuclear plants in the fall of 2001. Currently, nuclear waste, or spent fuel, is kept in high-density pools six to ten stories up in the reactor's secondary containment building. The pools share a common wall with an exterior wall of the building, and do not appear to have any structural reinforcement to prevent the likelihood of penetration by deliberate attack. Attack on a reactor could lead to rapid onset core melt with an open containment, accompanied by a raging fire. Due to high radiation fields across the site, access to the site by personnel would be precluded.

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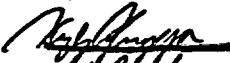

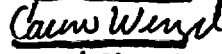

Even with the highest NRC rating or upgrades, nuclear plants are not invincible. They can approach near-meltdown conditions through mechanical failure alone, without any security breach from outside. The Project on Government Oversight found that nuclear plants in general still remain ill equipped, under-staffed, and under-trained. Public assurances by the NRC do little to dispel this impression.

Nuclear power plants present many complications and risks to our health, environment and economy, which are unique to this form of energy. Although the overall emissions from nuclear plants are significantly lower than other forms of energy, such as coal, carbon is emitted at every step of the nuclear fuel chain.

The Quad Cities Nuclear Power Station has outlived its purpose. We, the people, demand responsible energy solutions. Options, which can meet our needs, create new jobs, and stimulate the local economy. A license renewal for the QCNPS offers little more than higher utility bills, further environmental degradation and greater potential for a nuclear disaster.

We urge you to deny Exelon's request for an extension of their operating license for Quad Cities Units 1 and 2, and give us the opportunity to develop alternative energy sources that are renewable, do not pollute like diesel and coal, and do not generate dangerous radioactive waste which we have no feasible means to dispose of.

Sincerely,

Signature	Printed Name	Address
	<u>Douglas Claus</u>	<u>2 Walnut St Chicago IL 60601</u>
	<u>Kyle Knappe</u>	<u>131 John St. #3 Bkalis IL 60415</u>
	<u>Kyle Mohr</u>	<u>10512 96 Ke. Highway IL 61442</u>
	<u>CARON WENZEL</u>	<u>2107 EDGEWOOD WOODSTOCK IL 60097</u>
	<u>Cindy Enzler</u>	<u>4993 S. Daysville Rd. Oregon IL 61001</u>

Signature	Printed Name	Address
<i>Eric E. Peterson</i>	Eric E. Peterson	1830 Country Rd. Schaumburg, IL 60195
<i>Jim Lamb</i>	Jim Lamb	621 Dalton Pl Northbrook IL 60062
<i>Brent C. Peterson</i>	Brent C. Peterson	6321 High Country Dr NE Cedar Rapids IA 52411
<i>Joseph Benner</i>	NT Studevant St	50262
<i>Justin D. Hofman</i>	Justin D. Hofman	Davenport Iowa
<i>Mrs. Vollog</i>	1025 1/2 W. 4th	Davenport IA

<i>Justin Joeses</i>	Justin Joeses	5227 36th Ave RI
<i>Heather Hoglan</i>	Heather Hoglan	
<i>Ann McMillan</i>	Ann McMillan	20120 43rd Ave Ct N 81st BURTON IL 61225
<i>Kenneth Staples</i>	Kenneth Staples	721 Perry St. DAVENPORT IA
<i>LEE de las CASAS</i>	LEE de las CASAS	721 PERRY ST. DAVENPORT IA
<i>PATRICIA SIFFER</i>	PATRICIA SIFFER	2116 E. 53rd St DAV IA
<i>Erin Coltrane</i>	Erin Coltrane	1006 W. 17th St DAV, IA
<i>KELLY MAYFIELD</i>	KELLY MAYFIELD	430 W. 16th St DAV, IA
<i>Pauli Mayfield</i>	Pauli Mayfield	430 W. 16th St, DAV IA
<i>Dajah Zielstorf</i>	Dajah Zielstorf	1000 Harrison St DAV. IA
<i>Barbara Swanson</i>	Barbara Swanson	124 W. 13th St #9 DAV. IA
<i>Carrie Mirfield</i>	Carrie Mirfield	1086 Margostle Davenport IA
<i>Rachel Zoytner</i>	Rachel Zoytner	117 1/2 N. Cody Rd. DAV IA
<i>Trish Rindler</i>	Trish Rindler	2103 Cheyenne St DAV IA
<i>Hilda Hernandez</i>	Hilda Hernandez	349 W. 30th St DAV IA 52813
<i>Kris Hernandez</i>	Kris Hernandez	313 W. 30th St DAV IA 52803
<i>Scott Welch</i>	Scott Welch	5916 PINTO RD TUCSON AZ
<i>KEISTIN QUINN</i>	KEISTIN QUINN	409 E PUSKALME ST Davenport IA 52803
<i>VICTORIA NAVARRO</i>	VICTORIA NAVARRO	1223 E A ST 781 52813
<i>Amelia Schoeneman</i>	Amelia Schoeneman	514 2nd St R.I. Thom
<i>Megan Quinn</i>	Megan Quinn	" " " " "

Appendix A

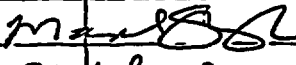


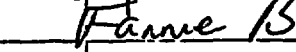
Signature	Printed Name	Address
<i>Mark Shipley</i>	Mark Shipley	Chicago, IL
<i>Jackie Mackay</i>	Jackie Mackay	Chicago
<i>Marvin Baseman</i>	MARVIN BASEMAN	IL
<i>Lynora Beyer-Clow</i>	LENORA BEYER-CLOW	Woodstock, IL
<i>Aimee Gillis</i>	Aimee Gillis	Ringwood, IL
<i>JAY RAKUS</i>	JAY RAKUS	1721 1/2 25th St. RT1, IL
<i>John Campbell, Craig G. Campbell, 1918 Douglas St., Rockford IL 61103</i>		
<i>Bern Parkhurst, 745 Hill Drive #214, Hoffman Estates IL 60134</i>		
<i>134th Lane Box #153 Cook 4324 CROWN P.O. #9712 Downers Grove IL 60515-9712</i>		
<i>JAMES CAMPBELL - 7th CRANION DR - Naperville, IL 60540</i>		
<i>CAREY G. DOAN</i>	Carey Doan	481 ARGYLE ELMHURST 60126
<i>Linda Law</i>	Linda Law	2326 Calwagner Melrose Pa. 17060
<i>Nicholas Anclis</i>	Nicholas Anclis	514 S. SENIARD ST. UMNEDBRO IL 61108
<i>Mary Meyer</i>	Mary Meyer	960 N. Meadows Freeport, IL 61032
<i>Janet Koeppen</i>	Janet Koeppen	Deerfield IL 60015
<i>Jim Cira</i>	Jim Cira	339 STERLING CIR Cary IL 60015
<i>Susan Crouse</i>	Susan Crouse	339 Sterling Cir. Cary IL 60013
<i>Elsa Kohl</i>	Elsa Kohl	1051 Brookside Dr. Deerfield IL 60015
<i>Bob Rudner</i>	Bob Rudner	1409 W. Lunt #2 Chgo IL 60626
<i>Anna Schaber</i>	Anna Schaber	2925 Edgewood Pkwy Woodridge, IL 60512
<i>Julie Maruna</i>	Julie Maruna	42 W. 160th St #108, Westmont IL 60559
<i>Mia Keyon Brown</i>	Mia Keyon Brown	879 Echo Ave Mechanicsville, VA 52306
<i>Sandford Tegjes</i>	Sandford Tegjes	2615 E Court St. IA 52245
<i>ACH DANA</i>	ACH DANA	2728 AVE GUEANSEY IA 52221
<i>John Bald</i>	John Bald	PO BOX 792 ANDALUSIA, IL 61232
<i>Matt Nowick</i>	Matt Nowick	2047 Market Blvd SE Cedar Rapids IA 52403



SIGNATURE	PRINT NAME	ADDRESS
<i>Kurt Guernsey</i>	KURT GUERNSEY	36768 GREENBUSH 12540 Boxwood Ct.
<i>Raymond M. Edwards</i>	Raymond H. Edwards	Huntley, IL 60142
<i>Sue Burkhardt</i>	Sue Burkhardt	12540 Boxwood Ct Huntley IL 60142
<i>Jeremy Dixon</i>	Jeremy Dixon	1164 W. Pleasant St Freeport IL 61531
<i>Elizabeth Fran</i>	Elizabeth Fran	6325 N. Mizant Chicago IL 60659
<i>Elean Kohl</i>	Elean Kohl	1031 Brookside Lindenfield IL 60139
<i>Michael Kullighey</i>	Michael Kullighey	204 Kenwood Oak Park IL 60273
<i>Walter C. Hind</i>	Walter C. Hind	7200 Wilson Ter, Merton IL 60053
<i>Arvin Lehner</i>	Arvin Lehner	1700 Main St. Groden, IL 60526
<i>Eric Stoden</i>	Eric Stoden	625 E Burlington St. #18
<i>Sabrina Susen</i>	Sabrina Susen	8625 E Burlington

Appendix A

Signature	PRINT NAME	Address
<i>Sue Breidigan</i>	Sue Breidigan	2430 Burlington Pl. Rockford IL 61107
<i>Linda Marlovitz</i>	LINDA MARLOVITZ	4652 N. Kenmore Chicago, IL 60640
<i>derek roller</i>	derek roller	521 E. Washington #3 ia CT7, ia 52240
<i>Colleen Sarna</i>	Colleen Sarna	100 N. Michigan Ave Chicago, IL 60607
<i>Mike Sandkroop</i>	MIKE SANDKROOP	4418 West Lombard St. Davonport Ia 52804
<i>Anna C. Child</i>	ANN HAMLUND	11 1/2 N. Cody LeClair Ia 52703
<del>MIKE SANDKROOP</del> 12345		



SIGNATURE	PRINT NAME	ADDRESS
	MARK SMITH	527 Babbitt St
	Judith C. Speer	15820 Rt 173
	Judy Bolmar	Harvard, IL 60033
	Fannie Burd	2003 N. Church St Peckin, IL 60103
	114 Union Street	60433

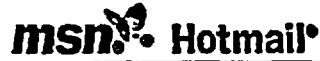


	Signature	Print NAME	Address
	<i>[Signature]</i>	Anneta Beckskin	C Dale, IL 61475
	<i>[Signature]</i>	Dennis Connolly	1145 Baker Hill Rd Cobden IL 62420
	<i>[Signature]</i>	Mary Jo Burke	118 Stagecoach Tr. Nora IL 61059
	<i>[Signature]</i>	Lynn Vogl	1230 E Honey Creek Rd. Oregon IL 61051
	<i>[Signature]</i>	John Vogl	1230 E. Honey Creek Rd. Oregon IL 61051
	<i>[Signature]</i>	<del>John Vogl</del>	<del>1519 18th St B. Moline IL 61761</del>
	<i>[Signature]</i>	Liz Turner	3403-15th Ave., Rock Island
	<i>[Signature]</i>	KONALD W. FELLIN	502 Jersey Ridge Rd, Riv. Jc. IL
	<i>[Signature]</i>	Jay Allison	1407 27th AVE Moline IL
	<i>[Signature]</i>	SARA Roberts	1407 27th AVE Moline IL
	<i>[Signature]</i>	monique mcdonald	1901 Sunny Hill Ct Bk 2A
	<i>[Signature]</i>	Lakisha	1631 Mississippi Blvd. Bettendorf IA
	<i>[Signature]</i>	Chi B...	212 E. Duison Duquoin IA 5281
	<i>[Signature]</i>	Ken Weh...	7207 118th Ave Rd. Wellwood IL
	<i>[Signature]</i>	Mike Blom...	220 2nd AJ Hayston, IL 61256
	<i>[Signature]</i>	Michelle Keller	1908 23rd St. Moline, IL 61265
	<i>[Signature]</i>	<i>[Signature]</i>	1908 ...
	<i>[Signature]</i>	Victoria Schw...	3110 Magnolia St Bett 9700
	<i>[Signature]</i>	Erson Singh	4570 Steinbeck Apt 3 Ames IA 50014
	<i>[Signature]</i>	SINGER	1821-2nd Ave. R.I. (61201)
	<i>[Signature]</i>	1821	2ND AVE R.I.
	<i>[Signature]</i>	Nick Lagson	10201 95th St. W. R.I. 61201

Appendix A

Signature	Print Name	Address
	Rebecca M. Wren	1203 1/2 5th Ave Apt #4 Moline, IL 61265
	Jon Smith	1112 25th Ave Ct Moline, IL 61265
	Luke Hull	IL 61265 3549 13th St. Mol. IL
	JOSHUA M. LONG	970 40th St Moline, IL 61262
	Larry Ortiz-Miller	4842 7th AVE #12 IL
	CLARE L Finley	3115 Tenth Ave Moline, IL 61203
	Joe Hodgett	500 White Oak Ct Geneseo, IL 61249
	Colt Detrick	1586 Slender Ct. Swisher, IA 52739
	MAN. J. J. J.	2917 30th St Moline IL 61265
	Anthony Thomas	2714 8th Ave Moline, IL 61265
	Matthew Foh	1174 N Madison Ave, Dubuque IA

			
	Felix Morelo	P.O. Box 3254	Rock Island Illinois ? ? ? ? ?
	ANA MOORE	1502 12th AVE	ROCK ISLAND IL 61201
			
	IAN HULSING	P.O. Box 3085	Rock Island IL 61201
	Clifford	Avenueport IA	52804
	2935 9 1/2 St E	Madison	
	LARRY MILLER		Stamphill
	1841 - 321st		
	Madison, IA		
	Kris Scher		
	Kris Scher		
	3242-36 Ave	Rock Island	IL 61201
	Karla Luteman	2500 - 21st Ave	
		R.D. 61201	
	Myra Luteman	25th 21st Ave	
		RT 61201	



wnbrfark@hotmail.com

Printed: Saturday, January 24, 2004 10:24 PM

**From:** Teresa Sieckert <tsloness@mchlink.com>  
**Sent:** Wednesday, September 10, 2003 6:37 PM  
**To:** "Leslie Perrigo" <wnbrfark@hotmail.com>  
**Subject:** Re: urgent, please sign on!

You have my permission to include my name on your petition - Teresa Sieckert - Muscatine, IA

— Original Message —

**From:** Leslie Perrigo  
**To:** ellotr@hotmail.com ; mjregan@mchsl.com ; mamadreadjo@aol.com  
**Cc:** onetrouth@yahoo.com ; tech@advancedenergyonline.com ; TheLorax@planet-save.com ;  
 nets@forward.net ; erwoodwork@yahoo.com ; Gmn14r@aol.com ; vwfatmobile@hotmail.com ;  
 mkenyon@lowacsn.org ; IECAN@yahoogroups.com ; steelbrightblade\_1@yahoo.com ; Jh2220@aol.com ;  
 jemsun@juno.com ; lady\_alchemy@celticcrow.com ; spikeschippedhead@msn.com ;  
 bleumage29@hotmail.com ; leannezone1@mchsl.com ; mdi5011@hotmail.com ; nirsnet@lgc.org ;  
 Kucansum@aol.com ; moose52556@yahoo.com ; jroot@mpw.org ; Slut\_Toy@SexMagnet.com ;  
 laugh@avalon.net ; spicoll.j@lycos.com ; info@eRideShare.com ; gratefulofearthmama@hotmail.com ;  
 tsloness@mchlink.com ; Schaferk645@aol.com ; timhites@mchsl.com ; todd@admospheres.com ;  
 tyrtlemyrde@metacrawler.com  
**Sent:** Tuesday, September 09, 2003 7:47 PM  
**Subject:** urgent, please sign on!

Hey all-

This is the shortened version of our petition to retire the Cordova Nuclear Power Plant at the end of its glorious and scary run, in 2012. Please please please sign on, and pass it around to your friends, family anyone you know who may be interested in helping with this. We are also forming a petitioning party for an upcoming saturday. If you would like to get involved call me at 563-445-0369. Keep up the good work beautiful people!

Leslie

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."  
- Margaret Mead

The Independent Environmental Conservation & Activism Network works to facilitate energy reform and serves as a watchdog organization for Iowa and the Illinois Quad Cities. Learn more about us!  
<http://iecan.tripod.com/index.html>

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.../getmsg?curmbox=F000000001&a=9c0c954ab1c2b756fb352e6d99587c79&msg=MSG10601/24/2004



Hello Leslie --

Please sign NEIS on to your NRC Petition Letter. If you need an actual person, here's how to write it:

David Kraft, Director,  
Nuclear Energy Information Service, Evanston, IL

Stay well, keep on doing,

--Dave Kraft, NEIS--



wntriark@hotmail.com

Printed: Saturday, January 24, 2004 10:19 PM

---

**From :** Mary Olson <nrs.se@mindspring.com>  
**Sent :** Friday, September 12, 2003 6:09 PM  
**To :** wntriark@hotmail.com  
**Subject :** sign-on

---

Hi Leslie -- if it will help, please add to your petition to close Quad Cities:

Mary Olson  
Director, Southeast Office  
Nuclear Information and Resource Service  
Asheville, North Carolina

A personal note -- I grew up in Mt. Carroll, Illinois -- not far from Davenport. That thing gave me the creeps when they started building it just as we moved away to Indiana...downwind of course!

.../getmsg?curmbox=F000000001&a=9e0c954ab1c2b756fb352c6d99587c79&msg=MSG10601/24/2004

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wntlark@hotmail.com

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**From:** WISE Amsterdam <wiseamster@antenna.nl>          
  
**Sent:** Thursday, September 11, 2003 7:49 AM
   
**To:** wntlark@hotmail.com
   
**Subject:** please include WISE

World Information Service on Energy, WISE  
Amsterdam, The Netherlands  
Peer de Rijk, director

New on the WISE Web Site: The Smiling Sun Web Shop  
at <http://www.antenna.nl/wise/shop/index.html>

World Information Service on Energy - WISE Amsterdam  
PO Box 59636  
(Visitors: Ketelhuisplein 43)  
1040 LC Amsterdam  
The Netherlands  
T: +31-20-6126368  
F: +31-20-6892179  
E: wiseamster@antenna.nl  
W: <http://www.antenna.nl/wise/>

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../getmsg?msg=MSG1063266883.159&start=507946&len=1529&mfs=&cmd=next&lastmsg01/24/2004

A DIRECT THREAT TO OUR ENVIRONMENT as well,

SEPT. 11 A YEAR LATER

MONDAY  
9-SEPTEMBER-2002

# Report: Al-Qaida considered hitting nuclear facilities

## Interview indicates terrorists have not ruled out option

DUBAI, United Arab Emirates (AP) — Al-Qaida considered striking U.S. nuclear facilities in the Sept. 11 attacks and has not ruled out nuclear attacks in the future, an Arab television reporter who interviewed two plotters of the terror attacks said Sunday.

Yosri Fouda, correspondent for the satellite station Al-Jazeera, told The Associated Press that he was taken, blindfolded, to a secret location in Pakistan to meet Khalid Shaikh Mohammed and Ramzi Binalshibh in a June interview arranged by al-Qaida operatives.

Fouda said he waited until now to air the audiotaped interview — it is scheduled to run Thursday on al-Jazeera — because he wanted to include it in a documentary marking the first anniversary of the attacks.

A videotape of al-Qaida leader Osama bin Laden released by U.S. officials in December for many established al-Qaida's responsibility for Sept. 11. According to Fouda's account, Mohammed and Binalshibh spell out the link even more clearly.

U.S. officials regard Mohammed as one of the highest-ranking al-Qaida leaders at large and believe he is still planning attacks against U.S. interests. U.S. officials say Binalshibh was a member of a

Hamburg-based cell led by Mohammed Atta, the Egyptian-born suspected lead hijacker on Sept. 11.

"I am the head of the al-Qaida military committee and Ramzi (Binalshibh) is the coordinator of the 'Holy Tuesday' operation," Fouda quoted Mohammed as saying, Sept. 11, 2001 fell on a Tuesday.

Mohammed said planning began two and a half years before Sept. 11 and that the first targets considered were nuclear facilities.

We "decided against it for fear it would go out of control," Fouda quoted Mohammed as saying. "You do not need to know more than that at this stage, and anyway it was eventually decided to leave out nuclear targets — for now."

Fouda, speaking by telephone from London, said al-Qaida operatives told him not to bring any electronic equipment — including a camera or recorder — to the interview. The al-Qaida members videotaped the interview but instead of sending a copy of the video as they promise, sent him only the audiotape, he said.

Fouda said at one point, while he was being led blindfolded to the meeting, he thought he was going to meet with al-Qaida leader Osama bin Laden.

Fouda said during the two days he spent talking to the two, Mohammed once referred to bin Laden in the past tense and that a sense of disarray led him to believe bin Laden could be dead.

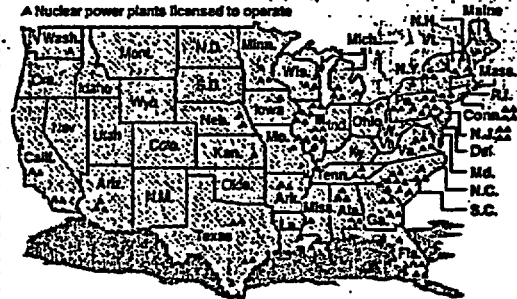
**Al-Qaida cells**  
Al-Qaida has terror cells in as many as 65 countries, according to the Congressional Research Service. Locations of the largest and most active cells.



Source: GANNETT NEWS SERVICE research Dave Merrill, GANNETT NEWS SERVICE

## Where the nukes are

Al-Qaida terrorists considered attacking a nuclear power plant in the United States, a Qatar television station reports. Only 103 of the 130 sites shown are in operation, but the other seven still contain radioactive waste.



Source: U.S. Nuclear Regulatory Commission Janet Loshitz, Gannett News Service

# Emotions spill over at Ground Zero

# ComEd seeks rate hike

## Utility to take case to state legislature

By Melita Marie Garza  
Tribune staff reporter

Commonwealth Edison Co. said Tuesday that it wants a long-term rate increase and quick regulatory approval to buy financially troubled Illinois Power Co.

Chicago-based ComEd, the state's largest electric utility, said it would ask the General Assembly to give state regulators the authority to act within

six months on the joint request. Under current law, the Illinois Commerce Commission "can take up to 11 months to raise rates and approve mergers."

ComEd declined to provide details about how much it wants to raise customers' electricity bills, but officials said the hike would be in "single digits."

If the Illinois Power deal is approved, ComEd's service territory would expand to cover 85 percent of Illinois, up from 70 percent. Company officials said that negotiations with Illinois Power remain under way and that they couldn't provide details. Last month, ComEd dis-

closed that it was in exclusive talks to buy the Decatur-based company, the state's second-largest electric utility.

ComEd wants lawmakers to consider its bill in the General Assembly's six-day fall session, which starts next month.

"We are listening to their ideas," said Steve Brown, a spokesman for Illinois House Speaker Michael Madigan (D-Chicago). Madigan is waiting to learn more next week at an informational hearing of the House Public Utilities Committee, Brown said.

PLEASE SEE COMED, PAGE 16

## COMED: CUB doubts need to lock in rates now

CONTINUED FROM PAGE 1

Unlike the much-criticized SEC Illinois deal this year, in which the state's largest phone company briefly won a wholesale rate increase from the legislature before it was overturned by a federal judge, ComEd officials said they are not making an end run around the rate-setting ICC. In this case, the ICC still would determine whether

ComEd could buy Illinois Power and raise customer bills.

But the Citizens Utility Board, a watchdog group, assailed ComEd's plan and vowed to fight it. CUB said it was troubled that the proposed rate increase was being linked with the Illinois Power purchase.

Any rate increase would not take effect until 2007. State lawmakers froze rates as a benefit to consumers when they deregulated Illinois' electric utilities several years ago.

"But what this is really about is locking in excessive rates through the end of the decade," said Martin Cohen, CUB's executive director.

Cohen said it is impossible for ComEd, a unit of Chicago-based Exelon Corp., to know now what reasonable rates will be in 2007

and beyond. Cohen argued that customers' electricity bills probably should decline because of what he described as a glut of electrical power, primarily caused by an overbuilding of natural gas generating plants.

"If the company wants a rate increase, it can seek one under the current law," Cohen said. "But it would have to justify that, and that is what ComEd is trying to avoid."

CUB criticized what it described as the rushed nature of ComEd's plan, coming right before the legislature's fall session.

Complicating the deal is the shaky financial condition of Illinois Power's parent company, Houston-based Dynegy Inc. Illinois Power and Dynegy carry debt ratings below investment

grade.

"Dynegy does not have the luxury of waiting," said ComEd President Frank Clark. "They are a company in financial stress, and they would, in my judgment, have to look at other options" besides a merger with ComEd.

Clark added, "The state legislature must act first, in order for Exelon to pursue this new opportunity."

Clark suggested that ComEd's merger with Illinois Power would be optimal for consumers, workers and businesses.

"We're firmly committed to Illinois and appreciate the importance of retaining local jobs, especially in hard-hit communities like Decatur," he said.

ComEd officials have been working behind the scenes to

muster support for the bid to buy Illinois Power. The Illinois Manufacturers Association, the Illinois Retail Merchants Association and the Chicagoland Chamber of Commerce are some of the business groups that have expressed support for the purchase.

Local units of the International Brotherhood of Electrical Workers also have expressed support.

"Exelon's commitment to job security and its pledge to invest in Illinois Power's infrastructure not only addresses the needs of working men and women in Illinois, it also ensures Illinois consumers will continue to benefit from a reliable power supply," said Dominic Rivara, president of IBEW Local 51.

Clark said that the union had

been pleased with voluntary separation packages and contract extensions offered by ComEd. Further, he said, Dynegy and Illinois Power have streamlined operations, leaving little room for more job cuts.

But CUB's Cohen said, "ComEd is trying to portray itself as the white knight coming in to save jobs downstate."

If the merger goes through, it would be the second ownership change for Illinois Power within four years. Dynegy bought Illinois Power in February 2000, when Dynegy was riding high as an energy-trading company.

Since then, Dynegy has exited the energy-trading business, restated earnings for the last three years and been under federal investigation for alleged accounting irregularities.

This could happen w/Exelon.

**Please protect the Mississippi River Watershed for future generations, and give our states the opportunity to develop more viable energy solutions for our communities.**

To Duke Wheeler,

QC14-1

In regards to the relicensing of the Quad City Nuclear Power Station, please retire this plant as it served its term, give us the opportunity to develop alternative energy sources, which will not pollute our air and waterways.

QC14-2

The initial licensing period wasn't based upon safety specifications. As the plant ages, the chances of accidents grow bigger,

Thank you  
Cucoberris  
Davenport Ia  
52806

Please protect the Mississippi River Watershed for future generations, and give our states the opportunity to develop more viable energy solutions for our communities.

Dear Sirs,

QC15-1

The Quad Cities nuclear power station has outlived its purpose. Increasing energy efficiency would actually provide us with more power than the QCNPS currently generates. The people of the Quad Cities deserve responsible energy solutions which can increase efficiency, meet our needs, create new jobs and stimulate the local economy. A license renewal for the QCNPS offers little more than higher utility bills, further environmental degradation and greater potential for a nuclear disaster.

Thanks,  
Richard Fischer



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGIONS  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

FEB 05 2004

RECEIVED

2004 FEB 19 AM 9:20

Rules and Directives  
REPLY TO THE ATTENTION OF  
B-191

Chief, Rules Review and Directives Branch  
U.S. Nuclear Regulatory Commission  
Mail Stop T6-D59  
Washington, D.C. 20555-0001

#113/03

68FR 64372

12

Re: **Generic Environmental Impact Statement for License Renewal of Nuclear Plant, Supplement 16: Quad Cities Nuclear Power Station, Units 1 and 2, Draft Report, NUREG-1437 (CEQ # 030513)**

Dear Sir or Madam:

In accordance with Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA), the U.S. Environmental Protection Agency (EPA) has reviewed the Generic Environmental Impact Statement for License Renewal of Nuclear Plant, Supplement 16: Quad Cities Nuclear Power Station, Units 1 and 2, which is a draft report. The Nuclear Regulatory Commission (NRC) developed the Generic Environmental Impact Statement (GEIS) to streamline the license renewal process on the premise that environmental impacts of most nuclear power plant license renewals are similar, in most cases. NRC develops facility-specific supplemental environmental impact statements (SEIS) for individual plants as the facilities apply for license renewal. EPA provided comments on the GEIS during its development process, in 1992 (draft) and again in 1996 (final).

The Exelon Generation Company, LLC has submitted a permit application to the NRC to extend the operating license for the Quad Cities Units 1 and 2 for an additional 20 years. The Quad Cities plant is located on the bank of the Mississippi River in Rock Island County, Illinois and has operated since 1973. The plant is a two-unit nuclear-powered steam electric plant with a once-through cooling system using water from the Mississippi River to remove heat from the main condensers and other auxiliary equipment. The reactors are refueled on a 24-month schedule. Spent fuel is stored in the spent fuel pool. Exelon plans to build dry storage casks for spent fuel storage and begin using them in 2005. The plant produces as much as 2,957 megawatts (thermal) and supplies electricity to 350,000 industrial, commercial, and residential users.

Based on our review of the Quad Cities draft SEIS, we have given the project an EC-2 rating. The "EC" means that we have environmental concerns with the proposed action, and the "2" means that additional information needs to be provided in the final SEIS. Our concerns include impacts from power uprates, on-site waste storage, transportation to off-site repositories, sediments, and estimates of risk. We recommend the NRC's final SEIS address these issues

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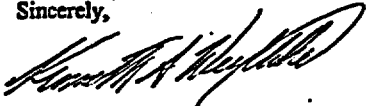


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because they involve changes in plant operation and changes to actual, potential, or cumulative environmental impacts. We have enclosed our comments and the U.S. EPA rating system summary.

If you have any questions or wish to discuss any aspect of the comments, please contact Anna Miller of my staff at (312) 836-7060.

Sincerely,



Kenneth A. Westlake, Chief  
Environmental Planning and Evaluation Branch  
Office of Strategic Environmental Analysis

Enclosures

**U.S. EPA Comments on  
Generic Environmental Impact Statement for License Renewal of Nuclear Plant,  
Supplement 16: Quad Cities Nuclear Power Station, Units 1 and 2, Draft Report,  
NUREG-1437**

- QC16-1      1. Although the license applicant's environmental report (ER) to the Nuclear Regulatory Commission (NRC) need not discuss aspects of storage of spent fuel, as noted on page 1-5, citing 10 CFR 51.23 (b), we suggest the NRC's final supplemental environmental impact statement (SEIS) discuss impacts from dry storage casks, because it would be a change in operation for the new license period. The draft SEIS states that Exelon plans to build an independent spent fuel storage installation for storing spent fuel in dry storage casks for use in 2005 (section 2.1.4, page 2-9). The change in storage option is not addressed elsewhere in the document. We suggest the NRC's final SEIS address spent fuel storage in dry storage casks, at least as far as it may be addressed in the License Renewal Generic EIS, and include discussion about potential environmental impacts. In particular, the final SEIS should describe any differences in environmental impacts associated with this change to storage.
- QC16-2      2. Although the applicant's ER need not discuss the demand for power, as noted on page 1-5, citing 10 CFR 51.53(c)(2), we note it is a reasonably foreseeable action and therefore should be discussed in the NRC's final SEIS. We note that Exelon requested and received NRC approval for a license amendment to carry out an 18% power uprate, which took place in May 2002 (section 2.1.4, page 2-9). The reports documenting the uprate's impact will not be delivered until May 2004, though the NRC estimates that the uprate could increase radiological effluent releases by a corresponding 18%. The draft SEIS states that the 18% radiological effluent increase will be within NRC limits. The draft SEIS does not, however, assess the potential for future uprates and the possible effects of future uprates. We recommend the final SEIS (1) include a discussion of environmental impacts from past power uprates, (2) assess the potential for future power uprates during the extended license period, and (3) discuss potential and cumulative environmental impacts from uprates.
- QC16-3      3. Under *Section 4.1 Environmental Impacts of Operation, Cooling System*, page 4-6: The generic no-impact language referenced in this section about sediments states that sediment contamination is not a problem at most plants, and no new or significant information has been identified for the Quad Cities site. Accumulation of contaminants in sediments is a cumulative impact. The absence of an impact over the past years of operation does not demonstrate that accumulations will not reach a level of concern over an additional 20 years of operation. Furthermore, copper discharge was an issue at one power plant and was satisfactorily mitigated, according to the GEIS. We recommend the final SEIS for the Quad Cities site describe the potential for accumulation of contaminants in sediments in light of 20 additional operating years and consider whether mitigation may be advisable.

- QC16-4 4. *Section 5.2.2, Estimate of Risk:* Page 5-5 states "The baseline core damage frequency (CDF) for Quad Cities is approximately  $2.2 \times 10^{-4}$  per year, based on internally-initiated events. Exelon did not include the contribution to CDF from external events in these estimates even though the risk from external events is significantly higher for Quad Cities than risk from internal events."

We recommend evaluating and presenting risk estimates from both internal and external events. In addition, given the draft SEIS statements referenced above, effects of external events should be included in the risk decision considerations, as necessary, to get an accurate portrayal of the risk of the licensing renewal. If the final SEIS does not incorporate external events into risk calculations or risk decisions, it should provide a rationale for using internally-initiated events only.

- QC16-5 5. *Section 6.1, The Uranium Fuel Cycle,* page 6-6. Under the bullet point for Off-site radiological impacts (spent fuel and high level waste disposal), no consideration appears to be given to the potential long term storage of the spent fuel and high level waste materials on site until such time as a permanent facility is finally licensed and begins to accept these materials for disposal. A reference to other sections or documents where this evaluation may have been included should be provided here; otherwise, the issue needs to be considered and evaluated.

- QC16-6 6. *Section 6.1, The Uranium Fuel Cycle,* page 6-8. Under the bullet point for On-Site Spent Fuel. A more thorough evaluation for the volume of spent fuel expected to be generated during the addition licensed time needs to be provided along with more specific information as to site specific circumstances that may impair or improve the risk values for potential exposures to this spent fuel.

- QC16-7 7. *Section 6.1, The Uranium Fuel Cycle,* page 6-8. The draft SEIS should be clearer about environmental impacts of transporting spent fuel to a repository site. We realize it may be premature to assess this fully on a power plant-specific basis; however, transportation to the nuclear waste repository appears to be reasonably foreseeable. The SEIS refers to the License Renewal GEIS (where transportation was discussed in a supplement: NUREG-14137, Vol.1, Addendum 1, 1999). The GEIS supplement, in turn, refers to the Draft Environmental Impact Statement (DEIS) for the Yucca Mountain Repository, which had not been finished at the time. These generic documents appear to assess impacts only within the State of Nevada. We recommend the final SEIS include more specific information about transport from this site, or else include a reference to route-specific impacts, as they may be covered in the Yucca Mountain Repository DEIS. In addition, we suggest the final SEIS be clear about whether transportation includes the process of removing spent fuel from casks and pools and loading it into vehicles. We suggest these processes be part of the transportation section, if not handled elsewhere, and we suggest the final SEIS discuss their impacts.

- QC16-8      8. *Section 7.1, Decommissioning, page 7-2, 7-3:* Under bullet point Radiation Doses. As the GEIS is based on a forty-year licensing period, an extension of another twenty years would have an site-specific impact with respect to radiation doses that needs to be quantified and reported. This information should be included specifically in the final SEIS as part of the risk that would be associated with the license extension.
- QC16-9      9.. *Coal Fired Generation Alternative, Section 8.2.1.1, Closed-Cycle Cooling System, page 8-21,* Under the Human Health bullet point: Any dose estimate that would have the potential to fall within the risk range of  $10^{-6}$  to  $10^{-4}$  or greater needs to be specifically evaluated for potential regulatory requirements or risk impacts to the public health. This should be estimated conservatively using the data that is currently available or that can be logically extrapolated from currently available information.
- QC16-10     10. *Nuclear Power Generation Alternative, Section 8.2.3.1, Closed -Cycle Cooling System, page 8-44:* Both waste impacts and human health impacts need to be specified rather than referenced to provide a clearer understanding of the risk determination made in this section of the document.

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## SUMMARY OF RATING DEFINITIONS AND FOLLOW UP ACTION\*

### Environmental Impact of the Action

#### LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

#### EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impacts. EPA would like to work with the lead agency to reduce these impacts.

#### EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

#### EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS site, this proposal will be recommended for referral to the CEQ.

### Adequacy of the Impact Statement

#### Category 1-Adequate

The EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collecting is necessary, but the reviewer may suggest the addition of clarifying language or information.

#### Category 2-Insufficient Information

The draft EIS does not contain sufficient information for the EPA to fully assess the environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

#### Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

\*From EPA Manual 1640 Policy and Procedures for the Review of the Federal Actions Impacting the Environment

## **Appendix B**

### **Contributors to the Supplement**

## Appendix B

### Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations, and the Lawrence Livermore National Laboratory. Representatives from Argonne National Laboratory, Pacific Northwest National Laboratory, Energy Research Incorporated, and the Information Systems Laboratory also participated in this review.

Name	Affiliation	Function or Expertise
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Louis Wheeler <sup>(a)</sup>	Nuclear Reactor Regulation	Project Manager
Michael Masnik	Nuclear Reactor Regulation	Aquatic Ecology, Alternatives, Project Manager
John Tappert	Nuclear Reactor Regulation	Section Chief
Barry Zalman	Nuclear Reactor Regulation	Technical Monitor
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Richard Emch	Nuclear Reactor Regulation	Project Management
Andrew Kugler	Nuclear Reactor Regulation	Cultural Resources, Land Use
Nina Barnett	Nuclear Reactor Regulation	Administrative Support
Cristina Guerrero	Nuclear Reactor Regulation	General Scientist
Jennifer Davis	Nuclear Reactor Regulation	Historical and Archaeological Resources
<b>LAWRENCE LIVERMORE NATIONAL LABORATORY <sup>(b)</sup></b>		
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Paul McGuff		Historical and Archaeological Resources
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Leon Clarke <sup>(c)</sup>		Alternatives
Jessie Coty		Terrestrial Resources
Gabriele Rennie		Technical Editor
Gloria Cannon		Technical Editor
Rita Wofford		Administrative Support
Priscilla Woods		Administrative Support

Appendix B

Name	Affiliation	Function or Expertise
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William Metz		Land Use, Related Federal Programs
William Vinikour		Aquatic Resources
<b>PACIFIC NORTHWEST NATIONAL LABORATORY<sup>(e)</sup></b>		
Stuart Saslow		Water Use, Hydrology
Eva Hickey		Radiation Protection
Van Ramsdell		Meteorology, Air Quality
<b>INFORMATION SYSTEMS LABORATORY</b>		
Kim Green		Severe Accident Mitigation Alternatives
James Meyer		Severe Accident Mitigation Alternatives
Bruce Mrowca		Severe Accident Mitigation Alternatives

(a) Retired in April 2004.

(b) Lawrence Livermore National Laboratory is operated for the U.S. Department of Energy by the University of California.

(c) Currently with Pacific Northwest National Laboratory.

(d) Argonne National Laboratory is operated for the U.S. Department of Energy by the University of Chicago.

(e) Pacific Northwest National Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute.



## **Appendix C**

### **Chronology of NRC Staff Environmental Review Correspondence Related to Exelon Generation Company, LLC's Application for License Renewal of Quad Cities Nuclear Power Station, Units 1 and 2**

## Appendix C

### Chronology of NRC Staff Environmental Review Correspondence Related to Exelon Generation Company, LLC's Application for License Renewal of Quad Cities Nuclear Power Station, Units 1 and 2

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Exelon Generation Company, LLC (Exelon) and other correspondence related to the NRC staff's environmental review, under 10 CFR Part 51, of Exelon's application for renewal of the Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2, operating licenses. All documents, with the exception of those containing proprietary information, have been placed in the Commission's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, MD, and are available electronically from the Public Electronic Reading Room found on the Internet at the following Web address: <<http://www.nrc.gov/reading-rm.html>>. From this site, the public can gain access to the NRC's Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC's public documents in the publicly available records component of ADAMS. The ADAMS accession number for each document is included below.

- November 12, 2002    Comments from the Regular Minutes of the Prophetstown City Council pertaining to QCNPS license renewal application (Accession No. ML031970772).
- January 3, 2003     Letter from Mr. Jeffrey A. Benjamin, Exelon, to NRC submitting the application for the renewal of the operating license for QCNPS, Units 1 and 2 (Accession No. ML030090203).
- January 10, 2003    NRC Press Release No. 03-007 "NRC Announces Availability of License Renewal Applications for Dresden and Quad Cities Nuclear Power Plants" (Accession No. ML030100360).
- January 22, 2003    Comment letter from Mr. James E. Bohnsack, County Board Chairman, Rock Island County Board, to NRC concerning the county board's decision to rescind their resolution of support for the license renewal of QCNPS (Accession No. ML030290020).
- January 24, 2003    Comment letter from Roger Drey, Mayor, City of Morrison, Illinois, to NRC regarding the license renewal of QCNPS, Units 1 and 2 (Accession No. ML030450342).

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- January 24, 2003 NRC staff letter to Mr. John L. Skolds, Exelon, forwarding an information copy of a notice sent to the Office of the *Federal Register* regarding receipt and public availability of the Dresden and QCNPS license renewal applications (Accession No. ML030240603) (The notice was published in the *Federal Register* on January 30, 2003, at 68 FR 4800-4801.)
- February 11, 2003 Letter from NRC staff to Ms. Sue Hebel, Cordova District Library, Cordova, Illinois, concerning the maintenance of reference material for public access related to the QCNPS license renewal environmental review (Accession No. ML030430199).
- February 11, 2003 NRC staff letter to Ms. Lisa Ford, River Valley Public Library, Port Byron, Illinois, regarding the maintenance of reference material for public access related to the QCNPS license renewal environmental review (Accession No. ML030430314).
- February 11, 2003 Letter from NRC staff to Ms. Cathy Stone, Davenport Public Library, Davenport, Iowa, concerning the maintenance of reference material for public access related to the QCNPS license renewal environmental review (Accession No. ML030430347).
- February 26, 2003 NRC staff letter to Mr. John L. Skolds, Exelon, forwarding an information copy of a *Federal Register* notice of acceptance for docketing of the application and notice of opportunity for hearing regarding the renewal of QCNPS operating licenses, and the NRC schedule for the safety and environmental reviews of the license renewal application. (Accession No. ML030570654). (The notice was published on March 4, 2003, at 68 FR 10273-10274).
- March 6, 2003 NRC staff letter to Mr. John L. Skolds, Exelon, forwarding an information copy of a *Federal Register* notice of intent to prepare an environmental impact statement and conduct scoping. (Accession No. ML030660237). (The notice was published on March 14, 2003, at 68 FR 12385-12386.)
- March 11, 2003 NRC staff letter to the Honorable Steve Cadue, Chairperson, Kickapoo Tribe of Indians of the Kickapoo Reservation in Kansas, inviting participation in the environmental review scoping process (Accession No. ML030720491).

- March 11, 2003 NRC staff letter to the Honorable Danny Kaskaske, Chairperson, Kickapoo Tribe of Oklahoma, inviting participation in the environmental review scoping process (Accession No. ML030710092).
- March 11, 2003 NRC staff letter to the Honorable Alex Walker, Jr., Chairperson, Sac & Fox Nation of the Mississippi in Iowa, inviting participation in the environmental review scoping process (Accession No. ML030710774).
- March 11, 2003 NRC staff letter to the Honorable John A. Barrett, Jr., Chairperson, Citizen Potawatomi Nation of Oklahoma, inviting participation in the environmental review scoping process (Accession No. ML030710725).
- March 11, 2003 NRC staff letter to the Honorable Harold Frank, Chairperson, Forest County Potawatomi Tribal Community, inviting participation in the environmental review scoping process (Accession No. ML030710160).
- March 11, 2003 NRC staff letter to the Honorable Gil Holliday, Chairperson, Huron Potawatomi Inc. of Michigan, inviting participation in the environmental review scoping process (Accession No. ML030720345).
- March 11, 2003 NRC staff letter to the Honorable David K. Sprague, Chairperson, Match-E-Be-Nash-She-Wish Band of Potawatomi Indians of Michigan, inviting participation in the environmental review scoping process (Accession No. ML030720315).
- March 11, 2003 NRC staff letter to the Honorable John Miller, Chairperson, Pokagon Band of Potawatomi Indians of Michigan, inviting participation in the environmental review scoping process (Accession No. ML030720282).
- March 11, 2003 NRC staff letter to the Honorable Zachariah Pahmahmie, Chairperson, Prairie Band of Potawatomi Tribal Council, inviting participation in the environmental review scoping process (Accession No. ML030720370).
- March 12, 2003 NRC staff letter to the Honorable Kenneth Meshigaud, Chairperson, Hannahville Indian Community, inviting participation in the environmental review scoping process (Accession No. ML030720573).
- March 12, 2003 NRC staff letter to the Honorable Juan Garcan, Jr., Provisional Chairperson, Kickapoo Traditional Tribe of Texas, inviting participation in the environmental review scoping process (Accession No. ML030720600).

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- March 12, 2003 NRC staff letter to the Honorable Sandra Keo, Chairperson, Sac & Fox Nation of Missouri in Kansas and Nebraska, inviting participation in the environmental review scoping process (Accession No. ML030720617).
- March 12, 2003 NRC staff letter to the Honorable Don Abney, Principal Chief, Sac & Fox Nation of Oklahoma, inviting participation in the environmental review scoping process (Accession No. ML030770275).
- March 12, 2003 NRC staff letter to the Honorable Lewis DeRoin, Chairperson, Iowa Tribe of Kansas and Nebraska, inviting participation in the environmental review scoping process (Accession No. ML030770314).
- March 12, 2003 NRC staff letter to the Honorable Lawrence P. Murray, Chairperson, Iowa Tribe of Oklahoma, inviting participation in the environmental review scoping process (Accession No. ML030770384).
- March 12, 2003 Letter from NRC staff to Mr. Rick Nelson, U.S. Fish and Wildlife Service, requesting information relevant to the NRC environmental review (Package No. ML030730775; Accession No. ML030730774; NRC letter; ML030760214, enclosures).
- March 14, 2003 NRC public meeting notice (memorandum with information for the NRC web site) of the April 8, 2003, public meetings in Moline, Illinois to facilitate public participation in the environmental review scoping process (Accession No. ML030730776).
- March 20, 2003 E-mail to the NRC staff from Exelon providing information requested during the site audit regarding groundwater drawdown (Accession No. ML031970777).
- March 31, 2003 NRC Press Release No. III-03-021, "Public Meetings April 8 on License Renewal of Quad Cities Nuclear Power Plant" (Accession No. ML030910264).
- April 11, 2003 E-mail to [QuadCitiesEIS@nrc.gov](mailto:QuadCitiesEIS@nrc.gov) from Mr. Scott Gardner providing public input to the environmental review scoping process (Accession No. ML031400164).
- April 17, 2003 NRC staff letter to Exelon requesting additional information regarding new and significant information (Accession No. ML031070572).

- April 24, 2003 E-mail to [QuadCitiesEIS@nrc.gov](mailto:QuadCitiesEIS@nrc.gov) from Mr. David Olson providing public input to the environmental review scoping process (Accession No. ML 031400167).
- May 2, 2003 NRC staff letter to Exelon revising request for additional information regarding new and significant information (Accession No. ML031220535).
- May 8, 2003 E-mail to [QuadCitiesEIS@nrc.gov](mailto:QuadCitiesEIS@nrc.gov) from Jack and Joyce Wiley providing public input to the environmental review scoping process (Accession No. ML031400174).
- May 8, 2003 Letter from Mr. Stephen K. Davis, Illinois Department of Natural Resources, providing input to the environmental review scoping process (Accession No. ML031420027).
- May 12, 2003 E-mail to [QuadCitiesEIS@nrc.gov](mailto:QuadCitiesEIS@nrc.gov) from M.J. Regan providing public input to the environmental scoping process (Accession No. ML031400177).
- May 14, 2003 Letter from Exelon providing supplemental information for the analysis of transmission lines at QCNPS (Accession No. ML031400661).
- May 14, 2003 E-mail from Exelon to the NRC staff providing information which was requested during the site audit regarding land use classifications (Accession No. ML031970776).
- May 23, 2003 NRC staff letter to Mr. John Skolds, Exelon, requesting additional information regarding Severe Accident Mitigation Alternatives and transmission lines (Accession No. ML031430600).
- May 27, 2003 NRC staff Note to File with information enclosed for the docket files and public availability which was provided to the staff by the licensee (Accession No. ML031480249).
- May 28, 2003 Letter from Exelon forwarding additional information regarding the environmental review (Accession No. ML031540677).
- June 3, 2003 NRC public meeting notice (memorandum with information for the NRC web site) of the June 7, 2003, public meetings in Rockville, MD to discuss the May 23, 2003, request for additional information regarding transmission line corridors (Accession No. ML031550388).

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- June 6, 2003 Letter to the NRC staff from the U.S. Department of the Interior, Fish and Wildlife Service, which provides comments regarding Federally listed threatened or endangered species for the proposed QCNPS license renewal (Accession No. ML031970770).
- June 16, 2003 Summary of the public scoping meetings held in Moline, Illinois, as part of the NRC staff environmental scoping process (Accession No. ML031631260).
- June 30, 2003 E-mail from Exelon to the NRC staff forwarding a draft of responses to the May 23, 2003, Request for Additional Information related to Severe Accident Mitigation Alternatives (Accession No. ML031960554).
- July 1, 2003 NRC staff letter to Ms. Anita Walker, State Historical Society of Iowa, providing information regarding plans for publishing this draft Supplemental Environmental Impact Statement and requesting comments (Accession No. ML031830396).
- July 1, 2003 NRC staff letter to Mr. Maynard Crossland, Illinois Historic Preservation Agency, providing information regarding plans for publishing this draft Supplemental Environmental Impact Statement and requesting comments (Accession No. ML031830303).
- July 3, 2003 E-mail from Exelon to the NRC staff providing replacement pages 2-3 and 2-34 for the QCNPS license renewal Environmental Report (Accession No. ML031970774).
- July 8, 2003 E-mail from Exelon to the NRC staff forwarding environmental monitoring data provided to Exelon by the Illinois Department of Nuclear Safety (Accession No. ML032030211).
- July 11, 2003 E-mail from Exelon to the NRC staff providing a revised draft response to SAMA Question 6c (Accession No. ML032030217).
- July 17, 2003 Exelon letter to the NRC staff providing the formal response to the staff's May 23, 2003, RAI (Accession No. ML032040302).
- July 21, 2003 NRC staff letter to Exelon regarding issuance of the Scoping Summary Report for the QCNPS license renewal environmental review (Accession No. ML032030456).

- July 24, 2003** NRC staff letter to Exelon providing the NRC staff position regarding Exelon's initial and subsequent interpretations of the NRC regulation regarding an assessment of electric shock from induced currents along transmission lines (Accession No. ML032050121).
- July 29, 2003** Summary of the June 17, 2003, meeting between the NRC staff and Exelon to discuss the May 23, 2003, RAI regarding the scope of transmission lines included in the ER and the July 24, 2003, NRC staff follow up letter to Exelon (Accession No. ML032100697).
- August 12, 2003** NRC staff letter to Mr. Rick Nelson, U.S. Fish and Wildlife Service, expanded the scope of the QCNPS license renewal environmental review, and requesting comments (Accession No. ML032250420).
- September 15, 2003** Letter from the U.S. Fish and Wildlife Service providing a response to the August 12, 2003, NRC staff letter requesting information regarding threatened and endangered species in the vicinity of the QCNPS site and transmission lines (Accession No. ML032730715).
- September 17, 2003** E-mail from Exelon to the NRC staff providing information related to MidAmerican Construction Services transmission line vegetation management practices (Accession No. ML032730712.)
- September 18, 2003** E-mail from Exelon to the NRC staff providing information on proposed procedure modifications to address interests related to potential historic and archeological sites (Accession No. ML032730705).
- September 22, 2003** NRC staff letter to Mr. Fidel Marquez, Exelon Energy Delivery, Transmission and Substations, regarding the findings of the QCNPS license renewal environmental review of the North Nelson Line (Accession No. ML032660226).
- October 14, 2003** E-mail from Exelon to the NRC staff providing information related to Alliant Energy transmission line vegetation management practices (Accession No. ML032890481).
- October 27, 2003** E-mail from Mr. William Maher, Exelon Generation Company, LLC, providing confirmation of completion of an Exelon procedure modification regarding the identification of potential historic or archaeological sites (Accession No. ML033090462).



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- October 30, 2003 Letter from the State Historic Society of Iowa reaffirming their concurrence in the no historic properties affected determination pending formal transmittal of that determination by the NRC staff (Accession No. ML033350301).
- November 4, 2003 NRC staff letter to the Environmental Protection Agency forwarding Draft Supplement 16 to NUREG-1437 for official filing (Accession No. ML033080207).
- November 4, 2003 NRC staff letter to Exelon forwarding Draft Supplement 16 to NUREG-1437 for review and comment (Accession No. ML033080241).
- November 14, 2003 NRC staff letter to the Environmental Protection Agency confirming the end date of January 27, 2004, for the public comment period (Accession No. ML033180512).
- November 19, 2003 NRC staff meeting notice regarding the December 16, 2003, public meeting in Moline, Illinois to receive public comments on Draft Supplement 16 to NUREG-1437 Accession No. ML033290621).
- December 4, 2003 NRC staff letter to U.S. Fish and Wildlife Service requesting review and concurrence in the staff's Biological Assessment (Accession No. ML033390062).
- December 16, 2003 Note from Dorothy Monahan to NRC given to the NRC staff at the December 16, 2003, public meetings in Moline, Illinois (Accession No. ML040090255).
- December 16, 2003 E-mail from Diane P. and Elmus M. Jeffery to the NRC staff providing comments regarding the proposed Quad Cities, Units 1 and 2 license renewals (Accession No. ML040080776).
- January 1, 2004 E-mail from Karene A. Nagel to the NRC staff providing comments regarding the proposed Quad Cities, Units 1 and 2 license renewals (Accession No. ML040080780).
- January 13, 2004 NRC staff letter to the State Historic Society of Iowa providing the staff determination of no historic properties affected by the proposed Quad Cities, Units 1 and 2 license renewals (Accession No. ML040140773).

- January 13, 2004 NRC staff letter to the Illinois Historic Preservation Agency providing the staff determination of no historic properties affected by the proposed Quad Cities, Units 1 and 2 license renewals (Accession No. ML040150460).
- January 15, 2004 Letter from U.S. Department of the Interior, Fish and Wildlife Service, providing concurrence with determination in the NRC staff Biological Assessment regarding the proposed license renewals (Accession No. ML040480551).
- January 16, 2004 Letter from U.S. Department of the Interior, Office of Environmental and Policy Compliance, providing comments on Draft Supplement 16 to NUREG-1437 (Accession No. ML040230534).
- January 26, 2004 Letter from Exelon providing comments on Draft Supplement 16 to NUREG-1437 (Accession No. ML040330857).
- January 26, 2004 E-mail from Illinois Emergency Management Agency providing comments on the Draft Supplement 16 to NUREG-1437 (Accession No. ML040330869).
- January 27, 2004 Letter from the Environmental Law and Policy Center providing comments on the Draft Supplement 16 to NUREG-1437 (Accession No. ML040330862).
- January 27, 2004 E-mail from MidAmerican Energy Company forwarding a MidAmerican letter dated January 27, 2004, which provides comments on the Draft Supplement 16 to NUREG-1437 (Accession No. ML040330882).
- January 27, 2004 E-mail from Leslie Perrigo providing comments regarding the proposed license renewals for Quad Cities, Units 1 and 2 (Accession No. ML040330875).
- February 3, 2004 Undated letter from Leslie Perrigo, received by the NRC Rules and Directives Branch on February 3, 2004, which provides comments on the proposed license renewals for Quad cities, Units 1 and 2 (Accession No. ML040420166).
- February 5, 2004 Letter from the U.S. Environmental Protection Agency, Region 5, to the NRC staff providing comments on Draft Supplement 16 to NUREG-1437 (Accession No. ML040500711).

## Appendix C

<b>February 26, 2004</b>	<b>Letter from the Illinois Historic Preservation Agency providing concurrence in the NRC staff determination of no historic properties affected for the proposed Quad Cities license renewal (Accession No. ML040620270).</b>
<b>February 26, 2004</b>	<b>Letter from the State Historical Society of Iowa providing concurrence in the NRC staff determination of no historic properties affected for the proposed Quad Cities license renewal (Accession No. ML040760505).</b>
<b>March 8, 2004</b>	<b>Summary of the public meetings held by the NRC staff in Moline, Illinois, to discuss the Draft Supplement 16 to NUREG-1437 (Accession No. ML040700332).</b>
<b>March 18, 2004</b>	<b>NRC staff letter to Mr. John Skolds, Exelon, informing Exelon of NRC environmental project manager assignments for QCNPS and DNPS license renewal reviews (Accession No. ML040830239).</b>

## **Appendix D**

### **Organizations Contacted**

## **Appendix D**

### **Organizations Contacted**

During the course of the staff's independent review of environmental impacts from operations during the renewal term, the following Federal, tribal, State, regional, and local agencies were contacted:

**Bi-State Regional Commission Community Development Director**

**Blackhawk Community College Vice President for Administration and Finance**

**City of Rock Island Public Works Director**

**Erie School District Superintendent**

**Forest Potawatomi Tribal Community**

**Hannahville Indian Community**

**Huron Potawatomi Inc. of Michigan**

**Illinois Department of Natural Resources—Springfield Office**

**Illinois Department of Transportation**

**Illinois Environmental Protection Agency—Compliance Unit**

**Illinois Environmental Protection Agency—Industrial Unit**

**Illinois Environmental Protection Agency—Watershed Management Section**

**Illinois Historic Preservation Agency**

**Illinois State Social Services Department**

**Iowa Area Education Association**

**Iowa Tribe of Kansas and Nebraska**

**Iowa Tribe of Oklahoma**

**Kickapoo Traditional Tribe of Texas**

**Kickapoo Tribe of Oklahoma**

**Match-E-Be-Nash-She-Wish Band of Potawatomi Indians of Michigan**

**Pokagon Band of Potawatomi Indians of Michigan**

**Potawatomi Nation of Oklahoma**

**Prairie Band of Potawatomi Tribal Council**

**Rock Island City Manager**

**Rock Island County Board of Supervisors Chairman**

**Rock Island County Director of Planning and Geographic Information Systems**

**Rock Island County Public Works**

**Rock Island County Sheriff's Department**

**Rock Island County Supervisor of Assessors**

**Rock Island Regional Office of Education**

**Sac and Fox Nation of Missouri**

**Sac and Fox Nation of Oklahoma**

**Sac and Fox Nation of the Mississippi in Iowa**

**Scott County Director of Planning and Development**

**State Historical Society of Iowa**

**University of Illinois Educational Extension, Rock Island County**

**Upper Mississippi National Wildlife and Fish Refuge—Savanna District**

**U.S. Fish and Wildlife Service—Rock Island Ecological Services Field Office**

**U.S. Fish and Wildlife Service—Twin Cities Field Office**

**Whiteside County Administrator**

**Whiteside County Regional Office of Education Regional Superintendent**

## **Appendix E**

### **Quad Cities Nuclear Power Station, Units 1 and 2 Compliance Status and Consultation Correspondence**



## Appendix E

### Quad Cities Nuclear Power Station, Units 1 and 2 Compliance Status and Consultation Correspondence

Correspondence received during the evaluation process of the application for renewal of the operating license for Quad Cities, Units 1 and 2 is identified in Table E-1. Copies of the correspondence are included at the end of this appendix.

The licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities for Quad Cities, Units 1 and 2 are listed in Table E-2.

**Table E-1. Consultation Correspondence**

Source	Recipient	Date of Letter
U.S. Nuclear Regulatory Commission (P. T. Kuo)	U.S. Fish and Wildlife Service (R. C. Nelson)	March 12, 2003
Illinois Department of Natural Resources (S. K. Davis)	U.S. Nuclear Regulatory Commission	May 8, 2003
U.S. Fish and Wildlife Service (R. C. Nelson)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	June 6, 2003
U.S. Nuclear Regulatory Commission (P. T. Kuo)	State Historical Society of Iowa (A. Walker)	July 1, 2003
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Illinois Historic Preservation Agency (M. Crossland)	July 1, 2003
U.S. Nuclear Regulatory Commission (P. T. Kuo)	U.S. Fish and Wildlife Service (R. Nelson)	August 12, 2003
U.S. Fish and Wildlife Service (R. C. Nelson)	U.S. Nuclear Regulatory Commission (L. L. Wheeler)	September 15, 2003
U.S. Nuclear Regulatory Commission (L. L. Wheeler)	Exelon Energy (F. Marquez)	September 22, 2003
State Historical Society of Iowa (D. Jones)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	October 30, 2003
U.S. Nuclear Regulatory Commission (L. L. Wheeler)	U.S. Fish and Wildlife Service (R. Nelson)	December 4, 2003

Appendix E

**Table E-1. (contd)**

<b>Source</b>	<b>Recipient</b>	<b>Date of Letter</b>
U.S. Nuclear Regulatory Commission (P. T. Kuo)	Illinois Historic Preservation Agency (M. Crossland)	January 13, 2004
U.S. Nuclear Regulatory Commission (P. T. Kuo)	State Historical Society of Iowa (A. Walker)	January 13, 2004
U.S. Fish and Wildlife Service (R. Nelson)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	January 15, 2004
Illinois Historic Preservation Agency (A. E. Haaker)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	February 26, 2004
State Historical Society of Iowa (D. Jones)	U.S. Nuclear Regulatory Commission (P. T. Kuo)	February 26, 2004

**Table E-2. Federal, State, Local, and Regional Licenses, Permits, Consultations, and Other Approvals for Current Quad Cities Units 1 and 2 Operation**

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
NRC	Atomic Energy Act 10 CFR Part 50	Operating license, Quad Cities Unit 1	DPR-29	December 14, 1972	December 14, 2012	Authorizes operation of Quad Cities Unit 1.
NRC	Atomic Energy Act 10 CFR Part 50	Operating license, Quad Cities Unit 2	DPR-29	December 14, 1972	December 14, 2012	Authorizes operation of Quad Cities Unit 2.
FWS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation	NA	N/A	NA	Requires a Federal agency to consult with FWS regarding whether a proposed action will affect endangered or threatened species.
NMFS	Section 7 of the Endangered Species Act (16 USC 1536)	Consultation	N/A	N/A	N/A	
Illinois Historic Preservation Agency	Section 106 of the National Historic Preservation Act (16 USC 470f)	Consultation	N/A	N/A	N/A	The National Historic Preservation Act requires Federal agencies to take into account the effect of any undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.
IEPA	Illinois Environmental Protection Act (Title 35 IAC, Subtitle C, Ch. 1)	National Pollution Discharge Elimination System	N/A	N/A	N/A	Permit for discharge of wastewater and once-through cooling water to the Mississippi. Section 1.E.15 of the permit states that the permit constitutes certification of compliance with Section 401 of the Federal Water Pollution Control Act (Clean Water Act).

Table E-1 (contd)

Agency	Authority	Description	Number	Issue Date	Expiration Date	Remarks
IEPA	IRS Ch. 111-1/2 Section 1039	Federally Enforceable Air Operating Permit	161807AAB	December 11, 2000	December 11, 2005	This permit authorizes emissions from diesel emergency generators, miscellaneous diesel engines, and miscellaneous emissions units and activities.
IEPA	IRS Ch. 111-1/2, Section 1039	Open Burning permit	App. #B0212031 ID #043083 Location ID #161807AAB	February 16, 2004	No date	Open burning for emergency response fire fighting training

CFR – Code fo Federal Regulations  
 FWS – U.S. Fish and Wildlife Service  
 NRC – Nuclear Regulatory Commission  
 NMFS – National Marine Fisheries Service  
 IEPA – Illinois Environmental Protection Act  
 IRS – Illinois Revised Statutes



UNITED STATES  
 NUCLEAR REGULATORY COMMISSION  
 WASHINGTON, D C 20555-0001

March 12, 2003

Mr Rick Nelson  
 Field Supervisor  
 U S Fish and Wildlife Service  
 4469 48<sup>th</sup> Avenue Court  
 Rock Island, IL 61201

**SUBJECT      REQUEST FOR COMMENTS CONCERNING QUAD CITIES NUCLEAR  
 POWER STATION APPLICATION FOR OPERATING LICENSE RENEWAL**

Dear Mr Nelson

The U S Nuclear Regulatory Commission (NRC) is reviewing an application for the renewal of the operating license for the Quad Cities Nuclear Power Station (QCNPS), located on the east bank of Pool 14 of the Mississippi River. As part of the review of the license renewal application, the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provision of the National Environmental Policy Act (NEPA) which includes analyses of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act and the Fish and Wildlife Coordination Act.

The proposed action would include use and continued maintenance of existing facilities and transmission lines and would not result in any new construction or disturbance. The Quad Cities Station is located in Rock Island County, Illinois. In total, for the specific purpose of connecting QCNPS to the regional transmission system, there are approximately 53 miles of corridor that occupy around 1100 acres of land. The transmission lines traverse the counties of Rock Island and Whiteside Counties, Illinois, and Scott and Clinton Counties in Iowa. Starting at QCNPS, the Davenport line runs south of the plant, turns west crossing the Mississippi River for 12.8 miles with a 180 foot right-of-way, ending just north of Davenport, Iowa. The Barstow line runs 2 miles southeast of QCNPS, and has a 520 foot right-of-way that ends in Rock Island County. There are two Nelson lines. The first is approximately 2 miles long heading southeast with a 520 foot wide right-of-way ending in Rock Island County, and the other line with a corridor width of 145 feet, runs 33 miles east of QCNPS ending in Rock Falls, Illinois. The last line connecting QCNPS to the regional system is the Rock Creek line, that runs 5 miles north of the station with a 170 foot right-of-way, terminates in Comanche, Iowa. Three figures are enclosed which show counties that fall within a 50-mile radius of QCNPS, a site boundary map, and a transmission line map.

The plant uses once-through (open-cycle) cooling water system which draws from and discharges to the Mississippi River to remove waste heat from the facility. River water is drawn through a canal, that is perpendicular to river flow, into the plant. The heated water is discharged back to the Mississippi River through two 16-foot-diameter diffuser pipes into the deepest part of the river channel. The Mississippi River in the vicinity of the plant is considered part of the aquatic environment of interest.

Appendix E

R Nelson

-2-

To support the environmental impact statement preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests a list of species and information on protected, proposed, and candidate species and critical habitat that may be in the vicinity of the Quad Cities Station and its associated transmission lines. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

We plan to hold a public NEPA scoping meeting on April 8, 2003, at The Mark of the Quad Cities, 1201 River Drive, Moline, Illinois. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The anticipated publications date for the Draft SEIS is November 2003.

If you have any questions concerning QCNPS, the license renewal application, or other aspects of this project, please contact Mr. Louis Wheeler, Senior Project Manager, at (301) 415-1444 or by email at [DXW@nrc.gov](mailto:DXW@nrc.gov).

Sincerely,



Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosure As stated

cc w/enc See next page

Appendix F - Environmental Report



- LEGEND**
- ★ Nuclear Power Plants
  - County Boundaries
  - ▨ Lakes and Rivers
  - Urban

**FIGURE 2-1**  
50-Mile Vicinity Map

Appendix F - Environmental Report

Appendix F - Environmental Report  
Section 2 Figures

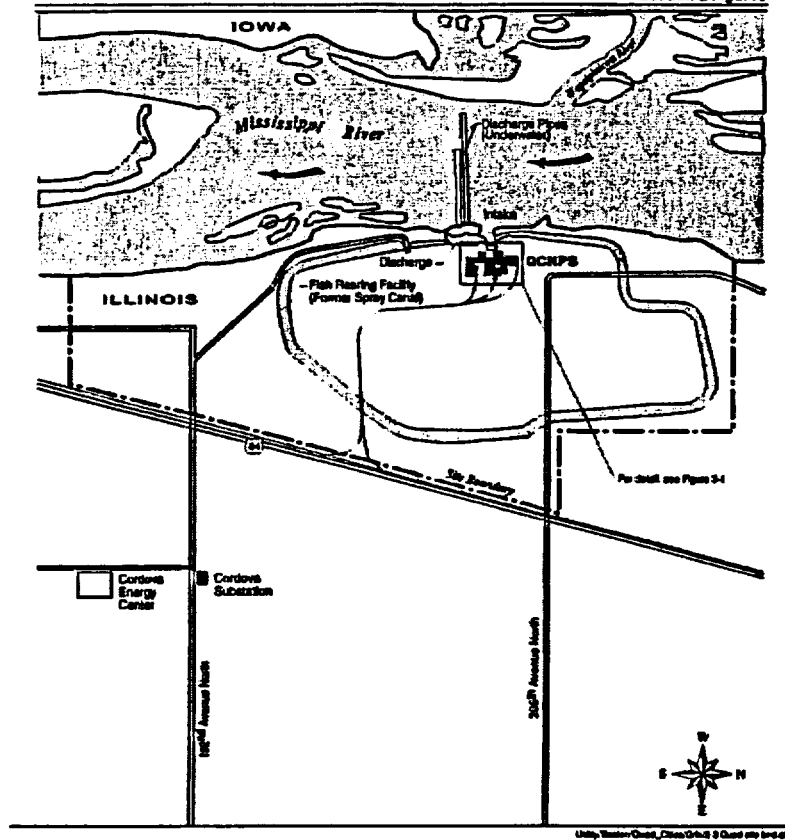
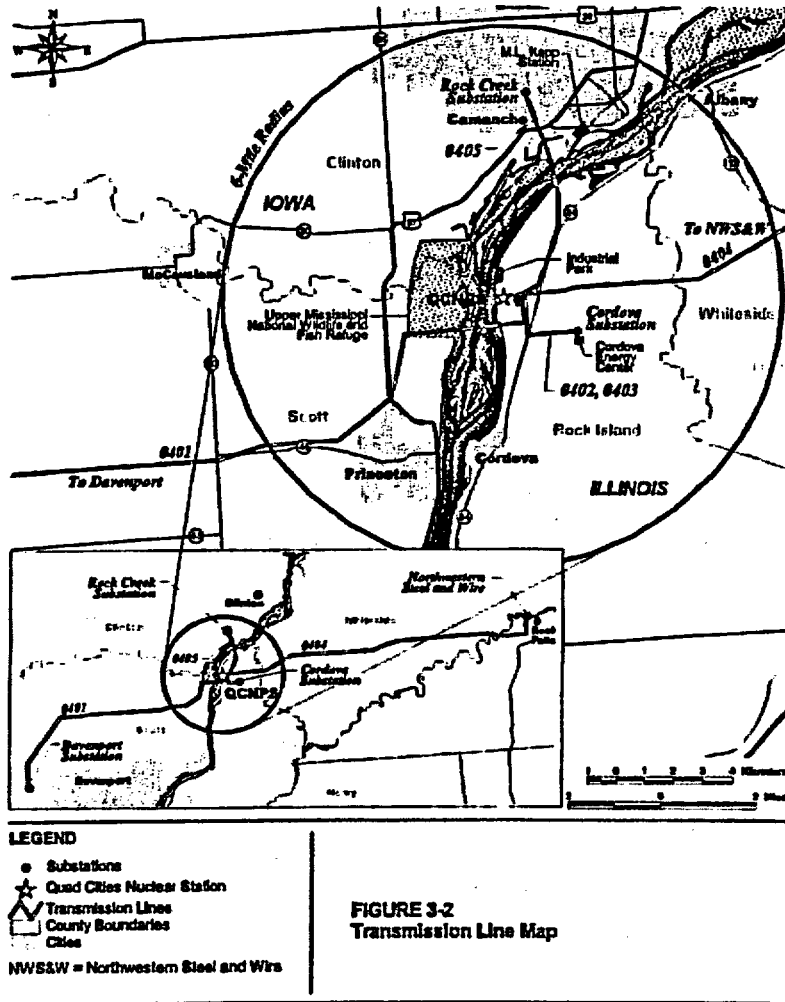


FIGURE 2-3  
Site Boundary.



Appendix F - Environmental Report





**Illinois**  
Department of  
**Natural Resources**

<http://dnr.state.il.us>

One Natural Resources Way • Springfield, Illinois 62702-1271

May 8, 2003

Rod R. Blagojevich, Governor

3/4/03  
68 FL 12385  
(6)

NRC Docket Nos. 50-254 and 50-265  
50-238 and 50-249

Chief of Rules and Directives Branch  
Division of Administrative Services  
Mailstop T-6D59  
United States Nuclear Regulatory Commission  
Washington, DC 20555

RECEIVED  
MAY 19 2003  
Division of Administrative Services

RE: Dresden Nuclear Power Station, Units 2 & 3 License Renewal  
Grundy County - License Nos. DPR-19 and DPR-25  
Quad Cities Nuclear Power Station, Units 1 & 2 License Renewal  
Rock Island County - License Nos. DPR-29 and DPR-30

Endangered Species Consultation Program  
Natural Heritage Database Review #'s 0201014 & 0201015

To Whom This Concerns.

Thank you for submitting the January 9, 2003 operating license renewal applications regarding the Quad Cities Nuclear Power Station, Units 1 & 2 and Dresden Nuclear Power Station, Units 2 & 3 for consultation in accordance with the Illinois Endangered Species Protection Act (520 ILCS 10/11), the Illinois Natural Areas Preservation Act (525 ILCS 30/17), and Title 17 Illinois Administrative Code Part 1075. The Natural Heritage Database identified the presence of State protected resources within the vicinity of portions of the existing transmission lines associated with each power station. Adverse impacts to State protected resources do not appear likely. Exelon has been advised to inform the Department if new transmission lines are proposed in the future.

The Department thoroughly discussed and evaluated the operating license renewal applications for each of the subject power stations. It is the Department's biological opinion that continued operation of the power stations, as described and detailed in the operating license applications, will not adversely affect State protected resources or existing environmental conditions in the immediate vicinity of the Dresden and Quad Cities nuclear power stations.

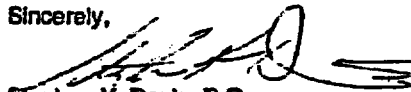
Consultation is limited to State-listed, threatened or endangered species, Illinois Natural Areas and dedicated Land & Water Reserves and Nature Preserves; it does not entail a comprehensive environmental impact assessment. The Department may raise concerns through other venues regarding potential impacts to other natural resources as it deems appropriate.

ADN-013  
ADN-013  
ADN-013 (B&W)

NRC Docket Nos. 50-254 and 50-265  
50-238 and 50-249

Thank you for the opportunity to comment on these nuclear power station operating license renewal applications. Should you have any questions, please do not hesitate to contact me

Sincerely,



Stephen K. Davis, P.G.  
Chief  
Division of Natural Resource Review and Coordination  
Office of Realty and Environmental Planning

cc: Division File  
M. Conlin  
T. Hickman  
R. Pietruszka  
D. Wheeler, NRC  
K. Jury, Excelon



IN REPLY REFER  
TO:  
FWS/RIFO

United States Department of the Interior

FISH AND WILDLIFE SERVICE  
Rock Island Field Office  
4469 48<sup>th</sup> Avenue Court  
Rock Island, Illinois 61201  
Phone: (309) 793-5800 Fax: (309) 793-5804



June 6, 2003

United States Nuclear Regulatory Commission  
Attn: Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
Washington, D. C. 20555-0001

Dear Pao-Tsin Kuo:

This is in response to your letter of March 12, 2003, requesting our comments regarding federally listed threatened and endangered species for the proposed Quad Cities nuclear power plant station application for operating license renewal for the Quad Cities Station in Rock Island County, Illinois.

The following federally listed species are known to occur in Rock Island and Whiteside Counties, Illinois and Scott and Clinton Counties, Iowa.

<u>Classification</u>	<u>Common Name (Scientific Name)</u>	<u>Habitat</u>
<b>Rock Island County</b>		
Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering
Endangered	Higgins' eye pearly mussel <i>Lampsilis higginsii</i>	sand/gravel substrates swift flowing current
<b>Whiteside County</b>		
Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering
<b>Scott County</b>		
Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering

Pao-Tsin Kuo		2
Endangered	Higgins' eye pearly mu ssel <i>Lampsilis higginsii</i>	sand/gravel substrates swift flowing current
Clinton County Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering/Breeding
Endangered	Higgins' eye pearly mu ssel <i>Lampsilis higginsii</i>	sand/gravel substrates swift flowing current
Endangered	Iowa Pleistocene snail ( <i>Discus macclintockii</i> )	algific talus slopes
Statewide Threatened	Prairie bush-clover <i>Lespedeza leptostachya</i>	dry to mesic prairies
Threatened	Eastern prairie fringed orchid <i>Discus macclintockii</i>	wet grassland habitats
Endangered	Indiana bat	caves, mines; small stream corridors with well- developed riparian woods; upland and bottomland forests

The threatened bald eagle is listed as breeding in Clinton and Scott Counties, Iowa. Bald eagles build their nests in large trees near rivers or lakes. A typical nest is around 5 feet in diameter. Eagles often use the same nest year after year.

During the winter, this species feeds on fish in the open water areas created by dam tailwaters, the warm water effluents of power plants and municipal and industrial discharges, or in power plant cooling ponds. The more severe the winter, the greater the ice coverage and the more concentrated the eagles become. They roost at night in groups in large trees adjacent to the river in areas that are protected from the harsh winter elements. They perch in large shoreline trees to rest or feed on fish. There is no critical habitat designated for this species. The eagle may not be harassed, harmed, or disturbed when present nor may nest trees be cleared.

The endangered Higgins' eye pearly mussel is known to occur in the Mississippi River north of Lock and Dam 20 which includes the above listed counties. This species prefers sand/gravel substrates with a swift current and is most often found in the main channel border or an open, flowing side channel.

You should refer to the following document, "2001 Monitoring Report - Unionid Relocation from the Cordova Energy Effluent Site at Mississippi River Mile 504," (Ecological Specialists, Inc., 2002). Freshwater mussels being affected by the effluent plume of the power plant were relocated in 1999. The Fish and Wildlife Service issued a Biological Opinion stating that the

project was "not likely to jeopardize the continued existence of *L. higginsii*" and allowed an incidental take of 33 *L. higginsii* over the life of the project (USFWS, 1999). Conditions of the Biological Opinion included relocating unionids from the discharge area and establishing a monitoring program for relocated unionids and unionids that might recolonize the discharge area.

One of the largest populations of *Higgins' eye pearl mussel* known to occur is in the Mississippi River near Cordova. The Biological Opinion and 2001 Monitoring Report should be reviewed and the conditions stated in these documents should be included in your environmental impact statement. If any other projects are located near a known Higgins' eye mussel bed, it may be necessary to conduct a survey to determine the presence of the species.

The endangered Iowa pleistocene snail is known to occur on north-facing slopes of the driftless area in Clinton County, Iowa. It occupies algal (cold producing) talus slopes at the outlet of underground ice caves along limestone bluffs within a narrow regime of soil moisture and temperature. There is no critical habitat designated. It must not be harmed, harassed or disturbed.

The prairie bush clover occupies dry to mesic prairies with gravelly soil. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever prairie remnants are encountered.

The eastern prairie fringed orchid occupies wet grassland habitats. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever wet prairie remnants are encountered.

The Indiana bat potentially may occur in all counties in Illinois and Iowa south of Interstate 80.

During the summer, the Indiana bat frequents the corridors of small streams with well developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age, and sex and ranges up to 81 acres (33ha). It roosts and rears its young in cavities and beneath the loose bark some live species of trees and those of large dead or dying trees. It winters in caves and abandoned mines.

An Indiana bat maternity colony typically consists of a primary roost tree and several alternate roost trees. The use of a particular tree appears to be influenced by weather conditions (temperature and precipitation). For example, dead trees found in more open situations were used more often during cooler or drier days while interior live and dead trees were selected during periods of high temperature and/or precipitation. It has been shown that pregnant and neonatal bats do not thermoregulate well and the selection of the roost tree with the appropriate microclimate may be a matter of their survival. The primary roost tree, however, appears to be

Pao-Tsin Kuo

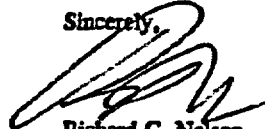
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used on all days and during all weather conditions by at least some bats. Indiana bats tend to be philopatric, i.e. they return to the same roosting area year after year.

These comments provide technical assistance only and do not constitute a report of the Secretary of the Interior on a project within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act, do not fulfill the requirements under Section 7 of the Endangered Species Act, nor do they represent the review comments of the U.S. Department of the Interior on any forthcoming environmental statement.

If you have any questions concerning our comments, please contact Craig McPeck of my staff at (309) 793-5800 ext 210

Sincerely,



Richard C. Nelson  
Supervisor

G:\Office Users\Craig\FERC\QC Nuclear (T&E Bat).doc



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

July 1, 2003

Ms Anita Walker  
Acting State Historic Preservation Officer  
State Historical Society of Iowa  
600 East Locust Street  
Des Moines, IA 50319-0290

SUBJECT QUAD CITIES NUCLEAR POWER STATION LICENSE RENEWAL REVIEW  
(REFERENCE NO 020482156)

Dear Ms Walker

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), which is located in Rock Island County, Illinois. Exelon Generation Company, LLC (Exelon) owns 75 percent of QCNPS and MidAmerican Energy Company (MidAmerican) owns the remaining 25 percent. Exelon holds the NRC license to operate the plant, acting for itself and as agent for MidAmerican. The application for renewal was submitted by Exelon on January 3, 2003, pursuant to NRC requirements at Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR 54). The NRC has established that, as part of the staff review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC rules that implement the National Environmental Policy Act (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources. A draft SEIS is scheduled for publication in November of 2003, and will be provided to you for review and comment.

In the context of the National Historic Preservation Act, the Agency official (the Director, Office of Nuclear Reactor Regulation, NRC) has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs which may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land disturbing operations or projected refurbishment activities, specifically related to license renewal, potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

While preparing its application, Exelon contacted your office by letter dated April 17, 2002, and your office responded on June 24, 2002. In its letter, Exelon stated that the operation of QCNPS, including the maintenance of identified transmission lines, through the license renewal term is not expected to affect cultural or historic resources in the area. Exelon further stated that no new construction was planned, and maintenance activities would be limited to previously disturbed areas. The June 24, 2002, State Historical Society of Iowa response letter stated that based on the information provided, no historic properties would be affected, and your office could concur with a determination of "No Historic Properties Affected" for this proposed project.




A Walker

2

We request that you respond to this letter and indicate whether there are any changes to the determination in your June 24, 2002, letter to Exelon. For your information, enclosed is one example of a letter sent from the NRC staff to 15 Native American Tribes identified by the Bureau of Indian Affairs as having potential interest in the proposed undertaking affording them the opportunity to participate in this process and identify issues of concern to them. No issues have been identified to date. If you have any questions or require additional information, please contact the Environmental Project Manager for the QCNPS project, Duke Wheeler at 301-415-1444 or [DXW@nrc.gov](mailto:DXW@nrc.gov)

Sincerely,



Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos 50-254, 50-265

Enclosure As stated

cc w/o encl See next page

**ENCLOSURE**

**LETTER TO THE HONORABLE ALEX WALKER, JR, CHAIRPERSON  
SAC & FOX NATION OF THE MISSISSIPPI IN IOWA  
(NATIVE AMERICAN TRIBE IDENTIFIED BY THE BUREAU OF INDIAN AFFAIRS)**

**MARCH 11, 2003**



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D C 20555 0001

March 11, 2003

The Honorable Alex Walker, Jr , Chairperson  
Sac & Fox Nation of the Mississippi in Iowa  
349 Meskawaki Road  
Tama, IA 52339

**SUBJECT: U S NUCLEAR REGULATORY COMMISSION REVIEW OF THE QUAD CITIES  
NUCLEAR POWER STATION LICENSE RENEWAL APPLICATION**

Dear Mr Walker

The U S Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Exelon Generation Company, LLC (Exelon) to renew its operating license for the Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), located in Rock Island County, Illinois. QCNPS is in close proximity to lands that may be of interest to the Sac & Fox Nation. As described below, the NRC process includes an opportunity for public participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to 10 CFR 51.28(b), the NRC invites the Sac & Fox Nation of the Mississippi in Iowa to provide input to the scoping process relating to the NRC's environmental review of the application.

The NRC will hold public scoping meetings for the QCNPS license renewal supplement to the NRC's "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS) (NUREG-1437). These scoping meetings will be held at the The Mark of the Quad Cities, 1201 River Drive, Moline, Illinois, on April 8, 2003. There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session. No formal comments on the proposed scope of the supplement to the GEIS will be accepted during the informal discussions. To be considered, comments must be provided either at the transcribed public meetings or in writing. The application and the environmental review process are described below.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating licenses for QCNPS will expire in 2012. Exelon submitted an environmental report as part of its application for renewal of the QCNPS operating license on January 3, 2003. The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS). ADAMS is accessible at <http://www.nrc.gov/reading-rm/adams.html>, which provides access through the NRC's Public Electronic Reading Room (PERR) link. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr@nrc.gov](mailto:pdr@nrc.gov). In addition, the application can be viewed on the Internet <http://www.nrc.gov/reactors/operating/licensing/renewal/applications/dresden-quad.html>.

## Appendix E

A Walker

- 2 -

A paper copy of the document can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, at the Cordova District Library, 402 Main Avenue, Cordova, Illinois, the River Valley Library, 214 South Main Street, Port Byron, Illinois, and at the Davenport Public Library, 321 Main Street, Davenport, Iowa. Also, the GEIS assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site. A copy of this document can also be found on the NRC's website or at the NRC's PDR.

The NRC is gathering information for the document that will be a QCNPS-specific supplement to the GEIS. The supplement will contain the results of the review of the environmental impacts on the area surrounding the QCNPS site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action.

Please submit any written comments the Sac & Fox Nation of the Mississippi in Iowa may have to offer on the scope of the environmental review by May 12, 2003. Comments should be submitted either by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6 D59, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or by e-mail to QuadCitiesEIS@nrc.gov.

At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified, the conclusions reached, and will mail a copy to you.

The NRC will prepare a draft supplemental environmental impact statement (SEIS) for public comment, and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final environmental statement for QCNPS is planned for July 2004. If you need additional information regarding the environmental review process, please contact Louis L. Wheeler, Project Manager, at (301) 415-1444.

Sincerely,



Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos. 50-254, 50-265

cc See next page



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

July 1, 2003

Mr. Maynard Crossland  
Director  
Illinois Historic Preservation Agency  
Preservation Services Division  
One Old State Capitol Plaza  
Springfield, IL 62701

SUBJECT QUAD CITIES NUCLEAR POWER STATION LICENSE RENEWAL REVIEW  
(IHPA LOG NO 020116003WVA)

Dear Mr. Crossland

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), which is located in Rock Island County, Illinois. Exelon Generation Company, LLC (Exelon) owns 75 percent of QCNPS and MidAmerican Energy Company (MidAmerican) owns the remaining 25 percent. Exelon holds the NRC license to operate the plant, acting for itself and as agent for MidAmerican. The application for renewal was submitted by Exelon on January 3, 2003, pursuant to NRC requirements at Title 10 of the Code of Federal Regulations Part 54 (10 CFR 54). The NRC has established that, as part of the staff review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC rules that implement the National Environmental Policy Act (NEPA). In accordance with 36 CFR 800.8, the SEIS will include analyses of potential impacts to historic and cultural resources. A draft SEIS is scheduled for publication in November of 2003, and will be provided to you for review and comment.

In the context of the National Historic Preservation Act, the Agency official (the Director, Office of Nuclear Reactor Regulation, NRC) has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs which may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land disturbing operations or projected refurbishment activities, specifically related to license renewal, potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

While preparing its application, Exelon contacted your office by letter dated January 11, 2002, and your office responded on February 7, 2002. In its letter, Exelon stated that the operation of QCNPS, including the maintenance of identified transmission lines, through the license renewal term is not expected to affect cultural or historic resources in the area. Exelon further stated that no new construction was planned, and maintenance activities would be limited to previously disturbed areas. The February 7, 2002, response letter stated that, based on the information provided, no historic properties would be affected, and IHPA had no objection to the undertaking proceeding as planned.

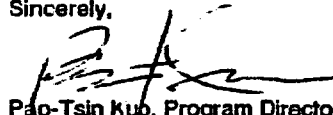
Appendix E

M Crossland

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We request that you respond to this letter and indicate whether there are any changes to the determination in your February 7, 2002, letter to Exelon. For your information, enclosed is one example of a letter sent from the NRC staff to 15 Native American Tribes identified by the Bureau of Indian Affairs as having potential interest in the proposed undertaking affording them the opportunity to participate in this process and identify issues of concern to them. No issues have been identified to date. If you have any questions or require additional information, please contact the Environmental Project Manager for the QCNPS project, Duke Wheeler at 301-415-1444 or [DXW@nrc.gov](mailto:DXW@nrc.gov)

Sincerely,



Pao-Tsin Kup, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos 50-254, 50-265

Enclosure As stated

cc w/o encl See next page

**ENCLOSURE**

**LETTER TO THE HONORABLE JOHN A. BARRETT, JR., CHAIRPERSON  
CITIZEN POTAWATOMI NATION, OKLAHOMA  
(NATIVE AMERICAN TRIBE IDENTIFIED BY THE BUREAU OF INDIAN AFFAIRS)  
MARCH 11, 2003**



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D C 20555 0001

March 11, 2003

The Honorable John A Barrett, Jr , Chairperson  
Citizen Potawatomi Nation, Oklahoma  
1901 South Gordon Cooper Drive  
Shawnee, OK 74801

SUBJECT U S NUCLEAR REGULATORY COMMISSION REVIEW OF THE QUAD CITIES  
NUCLEAR POWER STATION LICENSE RENEWAL APPLICATION

Dear Mr Barrett

The U S Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Exelon Generation Company, LLC (Exelon) to renew its operating license for the Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), located in Rock Island County, Illinois QCNPS is in close proximity to lands that may be of interest to the Potawatomi Nation As described below, the NRC process includes an opportunity for public participation in the environmental review We want to ensure that you are aware of our efforts and, pursuant to 10 CFR 51.28(b), the NRC invites the Citizen Potawatomi Nation of Oklahoma to provide input to the scoping process relating to the NRC's environmental review of the application

The NRC will hold public scoping meetings for the QCNPS license renewal supplement to the NRC's "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS) (NUREG-1437) These scoping meetings will be held at the The Mark of the Quad Cities, 1201 River Drive, Moline, Illinois, on April 8, 2003 There will be two sessions to accommodate interested parties. The first session will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary The second session will convene at 7:00 p.m., with a repeat of the overview portions of the meeting, and will continue until 10:00 p.m., as necessary Additionally, the NRC staff will host informal discussions one hour before the start of each session No formal comments on the proposed scope of the supplement to the GEIS will be accepted during the informal discussions To be considered, comments must be provided either at the transcribed public meetings or in writing The application and the environmental review process are described below

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years The license may be renewed for up to an additional 20 years if NRC requirements are met The current operating licenses for QCNPS will expire in 2012 Exelon submitted an environmental report as part of its application for renewal of the QCNPS operating license on January 3, 2003 The application is electronically available for inspection from the Publicly Available Records component of NRC's Agencywide Documents Access and Management System (ADAMS) ADAMS is accessible at <http://www.nrc.gov/reading-rm/adams.html>, which provides access through the NRC's Public Electronic Reading Room (PERR) link If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC's Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to [pdr@nrc.gov](mailto:pdr@nrc.gov) In addition, the application can be viewed on the Internet <http://www.nrc.gov/reactors/operating/licensing/renewal/applications/dresden-quad.html>



J Barrett

- 2 -

A paper copy of the document can be viewed at the NRC's PDR, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, at the Cordova District Library, 402 Main Avenue, Cordova, Illinois, the River Valley Library, 214 South Main Street, Port Byron, Illinois, and at the Davenport Public Library, 321 Main Street, Davenport, Iowa. Also, the GEIS assesses the scope and impact of environmental effects that would be associated with license renewal at any nuclear power plant site. A copy of this document can also be found on the NRC's website or at the NRC's PDR.

The NRC is gathering information for the document that will be a QCNPS-specific supplement to the GEIS. The supplement will contain the results of the review of the environmental impacts on the area surrounding the QCNPS site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action.

Please submit any written comments the Citizen Potawatomi Nation may have to offer on the scope of the environmental review by May 12, 2003. Comments should be submitted either by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6 D59, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001, or by e-mail to QuadCitiesEIS@nrc.gov.

At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified, the conclusions reached, and will mail a copy to you.

The NRC will prepare a draft supplemental environmental impact statement (SEIS) for public comment, and will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft SEIS will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final environmental statement for QCNPS is planned for July 2004. If you need additional information regarding the environmental review process, please contact Louis L. Wheeler, Project Manager, at (301) 415-1444.

Sincerely,



Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos. 50-254, 50-265

cc See next page



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

August 12, 2003

Mr Rick Nelson  
Field Supervisor  
U S Fish and Wildlife Service  
4469 48<sup>th</sup> Avenue Court  
Rock Island, IL 61201

**SUBJECT    EXPANDED SCOPE OF QUAD CITIES NUCLEAR POWER STATION  
APPLICATION FOR OPERATING LICENSE RENEWAL - REQUEST FOR  
COMMENTS**

Dear Mr Nelson

This letter requests comments regarding the expanded scope of the environmental review associated with the proposed license renewal for Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS)

First, thank you for your letter of June 6, 2003, responding to our March 12, 2003, letter which requested comments on the application submitted by Exelon Generation Company, LLC (Exelon) for the renewal of the operating licenses for QCNPS, located on the east bank of Pool 14 of the Mississippi River near Cordova, Illinois. To support the preparation of an environmental impact statement and to ensure compliance with Section 7 of the Endangered Species Act (ESA), the NRC staff requested information on protected, proposed and candidate species and critical habitat which may be in the vicinity of QCNPS and its associated transmission lines. In addition, we requested that you provide any information considered appropriate under the provisions of the Fish and Wildlife Coordination Act (FWCA)

As you may be aware from our March 12, 2003, letter, as part of the process for review of the license renewal application, the NRC staff is preparing a Supplemental Environmental Impact Statement under the provision of the National Environmental Policy Act. This will include analyses of pertinent environmental issues, including impacts to endangered or threatened species.

Based on new information provided by Exelon in response to an NRC staff request for additional information, the scope of the transmission lines included in this environmental review has been expanded since our March 12, 2003, letter. Specifically, the Davenport, Barstow, South Nelson and North Nelson lines have been extended as follows:

**The Davenport Line (0401):** Our March 12, 2003, letter stated this line was 12.8 miles from the QCNPS site to Substation 91. The portion of the line applicable to this environmental review has now been extended to a total length of 27 miles from QCNPS to Substation 56.

**The Barstow Line (0402):** Our letter stated this line was 2 miles long. It ended at the Cordova Energy Station. The portion of this line applicable to this environmental review now runs 17.5 miles from QCNPS to the Barstow Substation.

- 2 -

**The South Nelson Line (0403):** Our letter stated this line was 2 miles long. It also ended at the Cordova Energy Station. The portion of this line applicable to our review now runs 41.9 miles from QCNPS to the Nelson Substation.

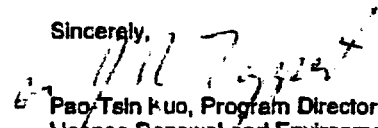
**The North Nelson Line (0404):** Our letter stated this line was 33 miles long. It ended in Rock Falls, Illinois at the Northwestern Steel and Wire Company. The portion of this line applicable to our review now runs 39.7 miles from QCNPS to the Nelson Substation.

The Rock Creek Line (0405) remains the same as stated in our March 12, 2003, letter.

As provided for by the ESA and FWCA, we request that you consider what effects the expanded scope of the project may have on endangered and threatened species of fish and wildlife. Please notify us of any issues which should be considered in our evaluation.

If you have any questions concerning the process for the NRC staff review of the license renewal application, please contact Mr. Louis Wheeler, Senior Project Manager, of my staff at (301) 415-1444 or via email at DXW@nrc.gov.

Sincerely,



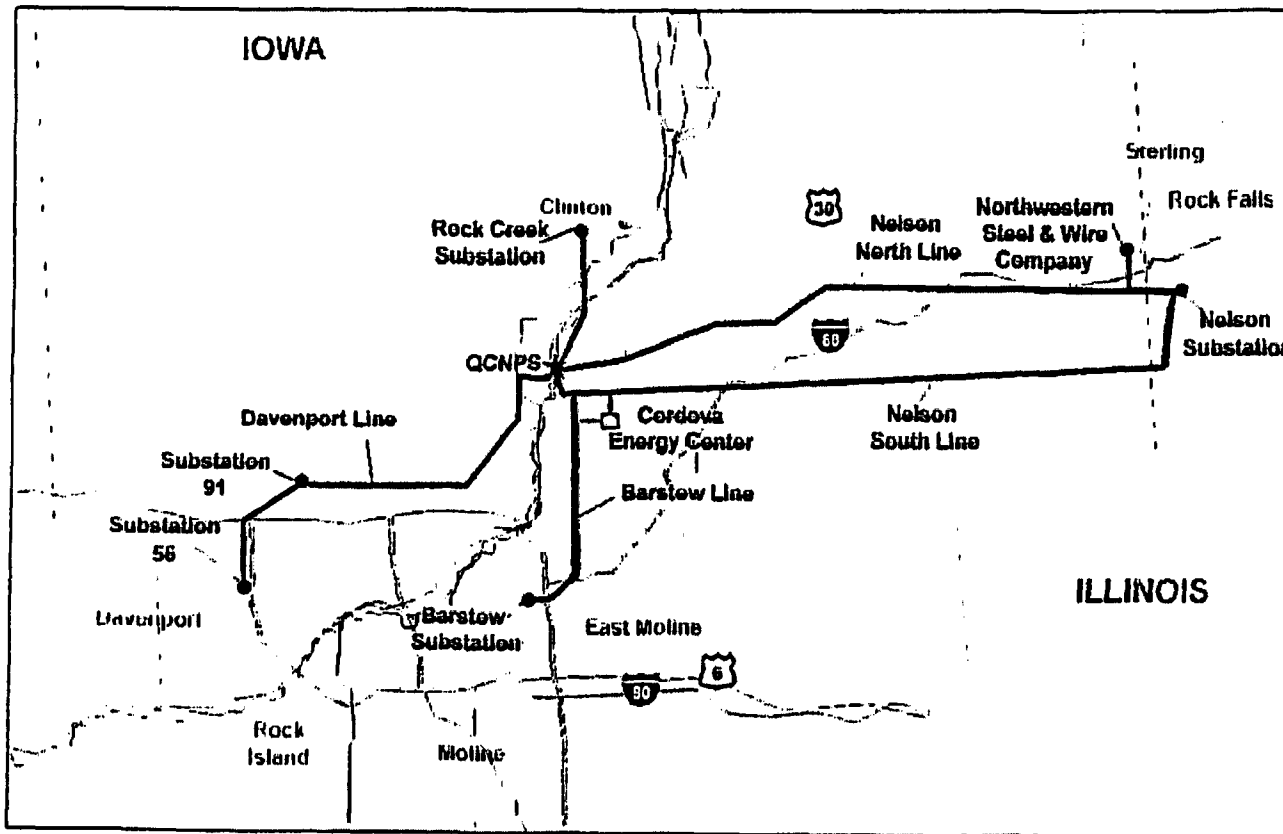
Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos. 50-237 and 50-249

Enclosure: QCNPS Transmission Line Map

cc w/encl. See next page

# QCNPS Transmission Lines





## United States Department of the Interior

## FISH AND WILDLIFE SERVICE

Rock Island Field Office  
 4469 41<sup>st</sup> Avenue Court  
 Rock Island, Illinois 61201  
 Phone: (309) 793-5800 Fax: (309) 793-5804



IN REPLY REFER  
 TO:  
 FWS/RIFO

September 15, 2003

United States Nuclear Regulatory Commission  
 Attn: Mr. Louis Wheeler, Senior Project Manager  
 License Renewal and Environmental Impacts  
 Division of Regulatory Improvement Programs  
 Office of Nuclear Reactor Regulation  
 Washington, D.C. 20555-0001

Dear Mr. Wheeler:

This is in response to your letter of August 12, 2003, requesting our comments regarding the expanded scope of the environmental review associated with the proposed license renewal for Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2 in Rock Island, Whiteside, Scott, Clinton, and Lee Counties in Iowa and Illinois. The expanded scope consists of expanding transmission lines into other counties.

The following federally listed species are known to occur in the counties of Rock Island, Whiteside, Scott, Clinton and Lee.

<u>Classification</u>	<u>Common Name (Scientific Name)</u>	<u>Habitat</u>
Rock Island County		
Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering
Endangered	Higgins' eye pearly mussel <i>Lampsilis higginsii</i>	sand/gravel substrates swift flowing current
Whiteside County		
Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering
Scott County		
Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering

Appendix E

Mr. Louis Wheeler

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Endangered	Higgins' eye pearly mussel <i>Lampsilis higginsii</i>	sand/gravel substrates swift flowing current
Clinton County Threatened	Bald eagle <i>Haliaeetus leucocephalus</i>	wintering/breeding
Endangered	Higgins' eye pearly mussel <i>Lampsilis higginsii</i>	sand/gravel substrates swift flowing current
Endangered	Iowa Pleistocene snail <i>Discus macclintocki</i>	algific talus slopes
Lee County Threatened	Prairie bush-clover <i>Lespedeza leptostachya</i>	dry to mesic prairies
Statewide Threatened	Prairie bush-clover <i>Lespedeza leptostachya</i>	dry to mesic prairies
Threatened	Eastern prairie fringed orchid <i>Discus macclintocki</i>	wet grassland habitats
South of Interstate 80 in Iowa and Statewide in Illinois Endangered	Indiana bat <i>Myotis sodalis</i>	caves, mines; small stream corridors with well- developed riparian woods; upland and bottomland forests

The threatened bald eagle is listed as breeding Clinton County, Iowa, and wintering in Rock Island and Whiteside Counties in Illinois and Scott and Clinton Counties in Iowa. Bald eagles build their nests in large trees near rivers or lakes. A typical nest is around 5 feet in diameter. Eagles often use the same nest year after year.

During the winter, this species feeds on fish in the open water areas created by dam tailwaters, the warm water effluents of power plants and municipal and industrial discharges, or in power plant cooling ponds. The more severe the winter, the greater the ice coverage and the more concentrated the eagles become. They roost at night in groups in large trees adjacent to the river in areas that are protected from the harsh winter elements. They perch in large shoreline trees to rest or feed on fish. There is no critical habitat designated for this species. The eagle may not be harassed, harmed, or disturbed when present nor may nest trees be cleared. Please refer to the enclosed "Management Guidelines for Breeding Areas."

Mr. Louis Wheeler

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The endangered Higgins' eye pearly mussel is known to occur in the Mississippi River north of Lock and Dam 20, which includes Rock Island, Scott and Clinton Counties. We have entered into Section 7 consultation with QCNPS in the past with regard to this species.

We recommend that you refer to the following document, "2001 Monitoring Report - Unionid Relocation from the Cordova Energy Effluent Site at Mississippi River Mile 504." (Ecological Specialists, Inc., 2002). Freshwater mussels being affected by the effluent plume of the power plant were relocated in 1999. The Fish and Wildlife Service issued a Biological Opinion stating that the project was "not likely to jeopardize the continued existence of *L. higginsii*" and allowed an incidental take of 33 *L. higginsii* over the life of the project (USFWS, 1999). Conditions of the Biological Opinion included relocating unionids from the discharge area and establishing a monitoring program for relocated unionids and unionids that might recolonize the discharge area.

One of the largest populations of *L. higginsii* in the world is known to occur in the Mississippi River near Cordova. The Biological Opinion and 2001 Monitoring Report should be reviewed and the conditions stated in these documents should be included in your environmental impact statement. If any other projects are located near a known Higgins' eye mussel bed, it may be necessary to conduct a survey to determine the presence of the species.

The endangered Iowa Pleistocene snail is known to occur on north-facing slopes of the driftless area in Clinton County, Iowa. It occupies algific (cold-producing) talus slopes at the outlet of underground ice caves along limestone bluffs within a narrow regime of soil moisture and temperature. There is no critical habitat designated. It must not be harmed, harassed or disturbed.

The prairie bush clover is known to occur in Lee County, Illinois and potentially occurs throughout Iowa and Illinois. Prairie bush clover occupies dry to mesic prairies with gravelly soil. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever prairie remnants are encountered.

The eastern prairie fringed orchid occupies wet grassland habitats and potentially occurs throughout Illinois and the eastern half of Iowa. Federal regulations prohibit any commercial activity involving this species or the destruction, malicious damage or removal of this species from Federal land or any other lands in knowing violation of State law or regulation, including State criminal trespass law. This species should be searched for whenever wet prairie remnants are encountered.

The Indiana bat may occur in all counties in Iowa south of Interstate 80 and statewide in Illinois.

During the summer, the Indiana bat frequents the corridors of small streams with well-developed riparian woods as well as mature upland forests. It forages for insects along the stream corridor, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age, and sex and ranges up to 81 acres (33ha). It roosts and rears its young in cavities and

Mr. Louis Wheeler

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beneath the loose bark some live species of trees and those of large dead or dying trees. It winters in caves and abandoned mines.

An Indiana bat maternity colony typically consists of a primary roost tree and several alternate roost trees. The use of a particular tree appears to be influenced by weather conditions (temperature and precipitation). For example, dead trees found in more open situations were used more often during cooler or drier days while interior live and dead trees were selected during periods of high temperature and/or precipitation. Indiana bats tend to return to the same roosting area year after year. Please refer to the attached "Indiana bat guidelines for Iowa and Illinois."

#### **Migratory birds**

In addition to trying to ensure that electrical transmission lines and structures do not adversely affect threatened and endangered species, the U. S. Fish and Wildlife Service is also interested in minimizing potential impacts to other wildlife resources, particularly migratory birds. The Migratory Bird Treaty Act (16 U.S.C. 703-712) prohibits the taking, killing, possession, sale, transportation and importation of migratory birds, their eggs, parts and nests, except when specifically authorized by the Secretary of the Interior. The Bald and Golden Eagle Protection Act (16 U.S.C. 668) prohibits the taking of any bald or golden eagle except when specifically authorized by the Secretary of the Interior. These laws do not allow the killing of migratory birds, including eagles without a permit. To avoid killing migratory birds, many companies employ raptor and migratory bird deterrents and line configurations, which minimize electrocution. These and other methods are described in *Avian Power Line Interaction Committee (APLIC), 1994; Mitigating Bird Collisions with Power Lines: The State of the Art in 1994, Edison Electric Institute, Washington D.C., 78 pp.*; *Avian Power Line Interaction Committee (APLIC), 1996; Suggested Practices for Raptor Protection on Power Lines, Edison Electric Institute/Raptor Research Foundation, Washington, D. C., 128 pp.* Copies can be obtained via the internet at <http://www.eei.org/productsandservices/descriptionandaccess/> or by calling 1-800-334-5453.

We encourage you to work with us to eliminate loss of migratory birds attributable to power lines and other power transmission facilities. If you would like additional information, please contact us as indicated below.

In addition, The Corps of Engineers is the Federal agency responsible for wetland regulation. We recommend that you contact them for assistance in delineating any wetland types and acreage within the expanded scope of the project. Priority consideration should be given to avoid impacts to these wetland areas. Any activities that would alter these wetlands may require a Section 404 permit. Unavoidable impacts will require a mitigation plan to compensate for any losses of wetland functions and values. The U.S. Army Corps of Engineers, Clock Tower Building, P.O. Box 2004, Rock Island, Illinois 61201, should be contacted for information about the permit process.

These comments provide technical assistance only and do not constitute a report of the Secretary of the Interior on a project within the meaning of Section 2(b) of the Fish and Wildlife Coordination Act, do not fulfill the requirements under Section 7 of the Endangered Species Act, nor do they represent the review comments of the U.S. Department of the Interior on any forthcoming environmental statement.

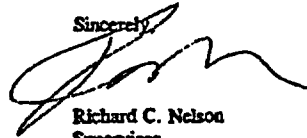


Mr. Louis Wheeler

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If you have any questions concerning our comments, please contact Ginger Molitor of my staff at (309) 793-5800 ext. 212.

Sincerely,



Richard C. Nelson  
Supervisor

Cc: Jessie Coy  
Enclosure

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From:  
Northern States Recovery Plan  
1983

Appendix E

MANAGEMENT GUIDELINES FOR BREEDING AREAS

The purpose of these guidelines is to provide minimum criteria for protecting bald eagles at their breeding areas from human disturbance and to preserve and enhance important habitat features of these areas. The criteria are based on a synthesis of existing guidelines in present use by the U.S. Forest Service (Eastern Region), U. S. Fish and Wildlife Service, and the views of eagle researchers.

Although eagles often use particular nests for many years, they frequently move to different sites. Turnover of existing nests, from losses to wind, changes by the eagles, and other natural factors may be as much as 12% of the sites per year. Eagle "real estate" is much less fixed than for humans. Thus, the conservation and management of nesting habitat is far more important than the identification and preservation of specific nest sites or even breeding areas.

Eagle tolerance of human presence is highly variable, both seasonally and among different individuals or pairs of eagles. Some bald eagles nest and accept people, boaters, hikers, cabins, roads, and other human presence in very close proximity, possibly as a result of habituation. On the other hand, some may be extremely intolerant and be disturbed readily. This variability must be recognized in both research and management. Management should be conservative and assume that intolerant birds may be present now or in the future. We should be especially conservative in areas with low populations.

All nesting eagles are disturbed more easily at some times of the nesting season than at others. Four periods of sensitivity to disturbance can be identified for nesting areas. These are as follows.

1. Most critical period. Prior to egg laying bald eagles engage in courtship activities and nest building. During this and the incubation periods they are most intolerant of external disturbances and may readily abandon the area. The most critical period for disturbances therefore extends from approximately one month prior to egg laying through the incubation period.
2. Moderately critical period. This includes approximately one month prior to the above period and about four weeks after hatching. Prior to the nesting season individual pairs of eagles vary considerably in time of return to the nest site or, if permanent residents, the time they begin to come into physiological condition for breeding and become sensitive to

- E1 -

disturbance. After hatching the chicks are quite vulnerable to inclement weather and need frequent brooding and feeding. Disturbance can keep adults from nests and, depending on the weather and length of time involved, may cause weakening or death of chicks. The adults are quite protective of the nest site as long as one or more healthy chicks are present. Thus, disturbance at this time is less critical, although still potentially detrimental, than during the pre-laying and incubation period.

3. Low critical period. This period extends from the time chicks are about one month of age until approximately six weeks after fledging. During this time adults are still quite attached to nesting areas but tolerate moderate amounts of human presence. Restriction should be decided on a case by case basis.
4. Not critical period. The existence of this period depends on whether adults are permanent residents in their nesting areas. In most regions adults leave the vicinity for a few weeks or months each year. During the time they are gone one need be concerned only with activities that alter the habitat in ways that would make it unsuitable for future nesting.

The timing of these periods depends on geographic location. Eagles tend to breed earlier farther south or in coastal locations. Establishment of critical periods in management planning will therefore depend on the timing of nesting in each area.

Management of nesting areas will depend on the amount of suitable habitat, numbers of pairs present, extent of the areas used by nesting eagles, and present land uses. Plans should be prepared for each breeding area and planning should encompass larger units when habitat is suitable and many nesting pairs are present. In planning for a large region, particularly if major changes in land use or development are anticipated, the following major items should be addressed:

1. Distribution of habitat modification. Large contiguous areas of habitat should remain suitable, not just small, specific sites where nests currently are located.
2. Upper limit to habitat modification. Limits on habitat modification should be clearly established in advance, and unplanned development should be discouraged or prohibited. Limits set in advance are generally more acceptable to persons desiring further development; the process permits reasonable negotiation and compromise and limits are easier to enforce.
3. Rate of development. Development should only be allowed to approach the upper limit slowly, over a period of years. Sudden, large-scale development should be prevented if possible.
4. Seasonal timing of human activity. Construction and related activities should be confined to the low or non-critical periods of the year described above.

- E2 -

5. Human attitudes toward eagles in the area. Much human-eagle interaction depends on the predominant attitude of human residents of each area. Residents and visitors of some areas are very favorably disposed toward the birds, if not proud and quite protective. They may be careful not to disturb the birds and may help prevent disturbance or destruction by other persons. Such attitudes should be encouraged through education and law enforcement. Illegal shooting of eagles, especially young birds of the year still in the vicinity of nests during the fall hunting season, should be severely penalized.

The above guidelines pertain to larger geographic units where several eagles may be nesting. The following pertain to specific breeding areas.

#### SITE-SPECIFIC MANAGEMENT PLANS

A. Basic information and essential habitat. Site-specific management plans should be tailored to the size and configuration of essential habitats, and should address such factors as the prey base, habitat used for foraging, and any other features necessary for maintaining habitat suitability. In addition, management plans should clearly specify restrictions on human activities and habitat alterations in establishing buffer zones around nests (see next point in outline). For basic information forms, see end of this appendix.

B. Disturbance Buffer Zones for Nest Trees. Each nest within a breeding area will be protected by three zones that become less restrictive to human activity as the distance from the nest increases. Some activities need to be restricted only during the nesting season, or critical periods. Guidelines for zones, based on those developed by the U. S. Forest Service in the Eastern Region and used in several parts of the United States, are described below. If buffer zones are used they should be established around all nest sites within a breeding area regardless of their activity status, since alternate nests often are used as feeding platforms and roosting sites.

##### 1. Primary Zone

- a) Size: The boundary of this zone should be 330 feet (5 chains) from the nest.
- b) Restrictions: All land use except actions necessary to protect or improve the nest site should be prohibited in this zone. Human entry and low-level aircraft operations should be prohibited during the most critical and moderately critical periods, unless performed in connection with eagle research or management by qualified individuals. Motorized access into this zone should be prohibited. Restrictions on human entry

at other times should be addressed in the breeding area management plan, considering the types, extents, and durations of proposed or likely activities.

## 2. Secondary zone

- a) **Size:** This zone should extend 660 feet (10 chains) from the nest.
- b) **Restrictions:** Land-use activities that result in significant changes in the landscape, such as clearcutting, land clearing, or major construction, should be prohibited. Actions such as thinning tree stands or maintenance of existing improvements can be permitted, but not during the most critical and moderately critical periods. Human entry and low-level aircraft operations should be prohibited during the most critical period unless performed in connection with necessary eagle research and management by qualified individuals. Roads and trails in this zone should be obliterated, or at least closed during the most and moderately critical periods. Restrictions on human entry at other times should be addressed in the breeding area management plan, considering the types, extents, and durations of proposed or likely activities.

## 3. Tertiary Zone

- a) **Size:** This is the least restrictive zone. It should extend one-quarter mile (20 chains) from the nest, but may extend up to one-half mile (40 chains) if topography and vegetation permit a direct line of sight from the nest to potential activities at that distance. The configuration of this zone, therefore, may be variable.
- b) **Restrictions:** Some activities are permissible in this zone except during the most critical period. Each breeding area management plan may identify specific hazards that require additional constraints.

## C. Other Management Guidelines.

### 1. Abandoned Nest Trees

- a) When a tree containing an eagle nest has blown down or has been damaged so it can no longer support a nest, remove all buffer zones. The breeding area management plan itself, however, should remain in effect or be revised, such as by removing buffer zones until a new nest is established.
- b) When a nest structure disappears but the nest tree remains the buffer zones should remain in effect through at least the following three breeding seasons. If the nest is not rebuilt, remove the zoning but still consider the area as essential habitat and protect it accordingly.

- c) When a nest is classified as a remnant, that is, one that has been unoccupied for five consecutive years, and is not being maintained by eagles, retain only the primary zone.

**Roosting and Potential Nest Trees.**

- a) Three or more super-canopy trees (preferably dead or with dead tops) should be identified and preserved within one-quarter mile of each nest as roosting and perching sites.
- b) In areas identified as potential nesting habitat, there should be at least four to six over-mature trees of species favored by bald eagles for every 320 acres within 1320 feet of a river or lake larger than 40 acres. These trees should be taller than surrounding trees or at the edge of the forest stand, and there should be clear flight paths to them.
- c) Artificial nest structures may be provided where suitable nest sites are unavailable in occupied or potential habitat. Structures may be placed in trees containing dilapidated nests; in trees without existing nests, but which otherwise appear suitable; or in man-made structures such as powerlines or tripods. Nest platforms should be approximately five to six feet in length and width (25-36 square feet) and be made to last for several years. Roosting structures may be erected using powerpoles with several horizontal perches near the upper end.

**3. Prey Base Management**

- a) Fisheries management should strive to maintain a prey base consistent with eagle food habits.
- b) In some breeding areas, particularly in the west, mammals form a portion of the diet of bald eagles. Land management in these areas should maintain an adequate prey base in terrestrial habitats.
- c) Feeding of eagles may be considered a valid management tool in areas where natural prey are highly contaminated or temporarily unavailable for some reason. This management option rarely will be used.
- d) In some regions, commercial and sport fishermen may be providing an important but unrecognized (by people) food source for eagles by dumping rough fish. Many commercial fishermen are also suffering from reduced catches of game fish and quotas imposed for the purpose of managing fisheries. Subsidization perhaps in the form of monetary or tax incentives might benefit eagles, fishermen, and possibly the fisheries.

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**SITE-SPECIFIC MANAGEMENT PLANS**  
Outline for data file and breeding area management plans

---

Breeding Area No. and Name: \_\_\_\_\_

Nest No.(s): \_\_\_\_\_

Location: \_\_\_\_\_

Date: \_\_\_\_\_

By: \_\_\_\_\_

**I. Breeding Area Characteristics**

- A. General Description  
Nest Site Relationships  
Overview of Habitat and Land Uses
- B. Feeding Areas (Known and/or Assumed)
- C. Known or Potential Perch/Roost Trees
- D. Potential Nest Sites Available
- E. Land Ownership within Breeding Area  
Identify Acquisition Needs
- F. Post-nesting Use of Habitat

**II. Nest Site Characteristics (Each nest in territory)**

- A. Tree Measurements (height, DBH, size); Nest Measurements
- B. Condition of Nest Tree
- C. Date Constructed
- D. Timber Type, Size and Density
- E. Distance to Water
- F. Distance to Roads and Other Development
- G. Accessibility
- H. Relation of Nest Height to Surrounding Canopy
- I. Precise Directions for Reaching Nest

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## Appendix E

**If the project site contains any habitat that fits the above description, it may be necessary to conduct a survey to determine whether the bat is present. If Indiana bats are known to be present, they must not be harmed, harassed or disturbed when present. Large-scale habitat alterations within known or potential Indiana bat habitat should not be permitted without a bat survey and/or consultation with this office.**

**Minor tree clearing (i.e. timber stand improvement or clearing of small stands) should conserve trees which are dead or have loose bark and should be limited to non-maternity periods between the dates of September 16 and April 14.**

**If you have any comments or questions, please contact the Rock Island Field Office at (309) 793-5800.**



### Guidelines for Protection of Indiana Bat Summer Habitat in Illinois

The endangered Indiana bat (*Myotis sodalis*) is known to occur in Adams, \*Alexander, Bond, Ford, \*Hardin, Henderson, \*Jackson, \*Jersey, Johnson, \*La Salle, Madison, Macoupin, McDonough, \*Monroe, Perry, Pike, \*Pope, Pulaski, Saline, Schryler, Scott, \*Union, and Vermilion Counties in Illinois. (\*Counties with hibernacula) The Blackball Mine in La Salle County has been listed as Critical Habitat. Potential habitat for this species occurs statewide, therefore, Indiana bats are considered to potentially occur in any area with forested habitat.

Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to a single young in June or early July. A maternity colony may include from one to 100 individuals. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during the summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females. The species or size of tree does not appear to influence whether Indiana bats utilize a tree for roosting provided the appropriate bark structure is present. However, the use of a particular tree does appear to be influenced by weather conditions, such as temperature and precipitation.

During the summer, the Indiana bat frequents the corridors of small streams with riparian woods as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, over farm ponds and in pastures. To avoid impacting this species, tree clearing activities should not occur during the period of April 15 to September 15. If a proposed action occurs within a 5-mile radius of a winter hibernacula, tree clearing should be prohibited from April 1 to November 15. If it is necessary to clear trees during this time frame, mist net surveys may be necessary to determine if Indiana bats are present. "Mist Netting Guidelines" can be obtained from our office. A search for this species should be made prior to any cave-impacting activities.

Suitable summer habitat in Illinois is considered to have the following characteristics within a ½ mile radius of a project site:

- 1) forest cover of 15% or greater;
- 2) permanent water;
- 3) one or more of the following tree species: shagbark and shellbark hickory that may be dead or alive, and dead bitternut hickory, American elm, slippery elm, eastern cottonwood, silver maple, white oak, red oak, post oak, and shingle oak with slabs or plates of loose bark;
- 4) potential roost trees with 10% or more peeling or loose bark

### Guidelines for Protection of Indiana Bat Summer Habitat in Iowa

The endangered Indiana bat (*Myotis sodalis*) has been noted as occurring in Appanoose, Clarke, Davis, Decatur, Des Moines, Henry, Iowa, Jasper, Jefferson, Keokuk, Lee, Louisa, Lucas, Madison, Mahaska, Marion, Monroe, Muscatine, Poweshiek, Ringgold, Union, Van Buren, Wapello, Warren, Washington, and Wayne Counties in Iowa. It could potentially occur in all counties south of Interstate 80, including those portions of Dallas, Polk, Jasper, Poweshiek, Iowa, Johnson, Muscatine and Scott counties south of Interstate 80.

Indiana bats migrate seasonally between winter hibernacula and summer roosting habitats. Winter hibernacula include caves and abandoned mines. Females emerge from hibernation in late March or early April to migrate to summer roosts. Females form nursery colonies under the loose bark of trees (dead or alive) and/or cavities, where each female gives birth to a single young in June or early July. A maternity colony may include from one to 100 individuals. A single colony may utilize a number of roost trees during the summer, typically a primary roost tree and several alternates. Some males remain in the area near the winter hibernacula during the summer months, but others disperse throughout the range of the species and roost individually or in small numbers in the same types of trees as females. The species or size of tree does not appear to influence whether Indiana bats utilize a tree for roosting provided the appropriate bark structure is present. However, the use of a particular tree does appear to be influenced by weather conditions, such as temperature and precipitation.

During the summer, the Indiana bat frequents the corridors of small streams with riparian woods as well as mature upland forests. It forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, over farm ponds and in pastures. To avoid impacting this species, tree clearing activities should not occur during the period of April 15 to September 15.

Suitable summer habitat in Iowa is considered to have the following characteristics within a ½ mile radius of a project site:

- 1) forest cover of 15% or greater;
- 2) permanent water;
- 3) one or more of the following tree species: shagbark and shellbark hickory that may be dead or alive, and dead bitternut hickory, American elm, slippery elm, eastern cottonwood, silver maple, white oak, red oak, post oak, and shingle oak with slabs or plates of loose bark;
- 4) potential roost trees with 10% or more peeling or loose bark

If the project site contains any habitat that fits the above description, it may be necessary to conduct a survey to determine whether the bat is present. If Indiana bats are known to be present, they must not be harmed, harassed or disturbed when present. Large-scale habitat alterations within known or potential Indiana bat habitat should not be permitted without a bat

survey and/or consultation with this office. "Mist Netting Guidelines" can be obtained from our office.

Minor tree clearing (i.e. timber stand improvement or clearing of small stands) should conserve trees which are dead or have loose bark and should be limited to non-maternity periods between the dates of September 16 and April 14.

If you have any comments or questions, please contact the Rock Island Field Office at (309) 793-5800.



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

September 22, 2003

Mr. Fidel Marquez  
Vice President, Exelon Energy Delivery  
Transmission and Substations  
2 Lincoln Centre  
Oakbrook Terrace, IL 60181

**SUBJECT: INFORMATION REGARDING THE NORTH NELSON LINE PERTAINING TO  
QUAD CITIES NUCLEAR POWER STATION LICENSE RENEWAL**

Dear Mr. Marquez:

The purpose of this letter is to provide information regarding a transmission line owned, operated and maintained by Exelon Energy Delivery which came to the attention of the U.S. Nuclear Regulatory Commission (NRC) staff during an environmental review related to an application by Exelon Generation Company, LLC (Exelon) for renewal of the operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2 (QC).

An Environmental Report (ER) was included with Exelon's license renewal application. The ER stated in Section 4.13, Electromagnetic Fields - Acute Effects, that EGC calculated induced currents using the AC/DCLINE computer code produced by the Electric Power Research Institute, and the results of the calculations have been verified through field measurements by several utilities. The input parameters included the National Electric Safety Code (NESC) requirements that line sag be determined at 120 degrees Fahrenheit conductor temperature, and the maximum vehicle size under the lines as a tractor trailer truck.

The NESC specifies a maximum field strength of 5 milliamperes. However, Exelon's ER stated that one of the lines reviewed (the North Nelson Line - 0404) had a limiting case induced current of 8.0 milliamperes. The NRC staff has determined that the environmental impact of license renewal is SMALL for lines which comply with NESC specifications. The NRC staff has further determined that for the North Nelson Line, the environmental impact of the proposed license renewal is MODERATE, based on the amount by which this line exceeds the NESC Code specification. This determination will be included in a draft environmental impact statement scheduled for publication in November 2003.

If there are any questions regarding this correspondence, please contact me at (301) 415-1444.

Sincerely,

Handwritten signature of Louis L. Wheeler.

Louis L. Wheeler, Senior Project Manager  
Environmental Section  
License Renewal and Environmental Impacts Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

cc: See next page



Division of the Iowa Department of Cultural Affairs

October 30, 2003

In reply refer to:  
R&C#: 020482156

Pao-Tsin Kuo, Program Director  
License Renewal & Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

RE: NRC - SCOTT COUNTY - RS-02-079 - QUAD CITIES NUCLEAR POWER STATION  
UNITS 1 & 2 LICENSE RENEWAL - POWER STATION LICENSE RENEWAL REVIEW -  
ADDITIONAL CORRESPONDENCE FROM NRC


Dear Mr. Pao-Tsin Kuo,

We have received and reviewed the submitted additional correspondence concerning the above referenced project. We understand that there is no new construction proposed as part of the license renewal. This renewal is limited to maintenance of existing transmission lines in Iowa. These activities will be limited to the currently existing R.O.W. We also understand that portions of the currently existing R.O.W. have been previously surveyed and one previously identified archaeological site, 13ST157, is located within the R.O.W. This site was previously evaluated as not eligible for listing on the National Register of Historic Places and our office concurred with that determination. Based on all of this information, we still could concur with a determination of No Historic Properties Affected for this proposed project once that determination has been provided to our office by your federal agency for this proposed federal undertaking.

We have made these comments and recommendations according to our responsibility defined by Federal law pertaining to the Section 106 process. The responsible federal agency does not have to follow our comments and recommendations to comply with the Section 106 process. It remains the responsible federal agency's decision on whether or not to provide additional information to our office or whether or not to proceed with the project without the concurrence of this office. It also remains the responsible federal agency's decision on how you will proceed from this point for this project.

Should you have any questions please contact me at the number below.

Sincerely,

  
Douglas W. Jones, Archaeologist  
Historic Preservation Bureau  
(515) 281-4358

cc: Rosetta O. Virgilio, Federal Preservation Officer, U.S. Nuclear Regulatory Commission

600 EAST LOCUST STREET, DES MOINES, IA 50319-0290 P: (515) 281-5111



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

December 4, 2003

Mr. Richard C. Nelson  
Supervisor  
U.S. Fish and Wildlife Service  
4469 48th Avenue Court  
Rock Island, Illinois 61201

Subject: REQUEST FOR CONCURRENCE - BIOLOGICAL ASSESSMENT FOR QUAD  
CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 LICENSE RENEWAL

Dear Mr. Nelson:

The Nuclear Regulatory Commission (NRC) staff has prepared the enclosed Biological Assessment (BA) to evaluate whether the proposed renewal of the operating licenses of the Quad Cities Nuclear Power Station, Units 1 and 2 (Quad Cities), for an additional 20-year period would have adverse effects on listed species, and request concurrence by your office.

Quad Cities is located on the east bank of Pool 14 of the Mississippi River between Lock and Dams 13 and 14, and 815.1-km (506.5 mi) upstream from its confluence with the Ohio River. This BA evaluates the potential impacts of the proposed license renewal on Federally listed threatened or endangered species. Seven species, afforded protection under the Endangered Species Act of 1973, could potentially inhabit the Quad Cities site or transmission line rights-of-way (ROWs). For five of the species, the renewal of the licenses for an additional 20 years will have "no effect." For the bald eagle (*Haliaeetus leucocephalus*) and the Higgins' eye pearl mussel (*Lampsilis higginsii*), known to occur near or occasionally use the site or ROWs, license renewal may affect, but is not likely to adversely affect these two species.

In reaching our conclusion, we relied on information provided by Exelon Generation Company, LLC (the licensee), on research performed by the NRC staff, and on current listings of species provided by the Rock Island Field Office of the U.S. Fish and Wildlife Service.

If you have any questions regarding this BA or our request for concurrence, please contact, Mr. Duke Wheeler, NRC Senior Environmental Project Manager, at (301) 415-1444.

Sincerely,

A handwritten signature in black ink, appearing to read "Pao-Tsin Kuo".

Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos.: 50-254 and 50-265

Enclosure: As stated

cc w/encl: See next page

## **Biological Assessment**

**Quad Cities Nuclear Power Station, Units 1 and 2  
License Renewal Review**

**Rock Island County, Illinois**

**December 2003**

**Docket Nos. 50-254 and 50-265**

**U.S. Nuclear Regulatory Commission  
Rockville, Maryland**

Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

Enclosure

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## Biological Assessment of the Effects of License Renewal for the Quad Cities Nuclear Power Station, Units 1 and 2 on Threatened or Endangered Species

### Executive Summary

This Biological Assessment (BA) evaluates the potential impacts of the proposed license renewal for the Quad Cities Nuclear Power Station, Units 1 and 2 (Quad Cities) on Federally listed threatened or endangered species. There will be no major construction, refurbishment, or replacement activities associated with this action. A total of seven species, afforded protection under the Endangered Species Act of 1973, could potentially inhabit the Quad Cities site or transmission line rights-of-way (ROWs). The U.S. Nuclear Regulatory Commission (NRC) staff has conducted a BA of these seven species and has determined that five of the species, the western prairie fringed orchid (*Platanthera praeclara*), the eastern prairie fringed orchid (*Platanthera leucophaea*), the prairie bush-clover (*Lespedeza leptostachya*), the Indiana bat (*Myotis sodalis*), and the Iowa Pleistocene snail (*Discus macclintocki*) are not known from the site or transmission ROWs. For these five species the NRC staff has concluded that the renewal of the Quad Cities license for an additional 20 years will have "no effect." For the bald eagle (*Haliaeetus leucocephalus*) and the Higgins' eye pearl mussel (*Lampsilis higginsii*), known to occur near or occasionally use the site or ROWs, the staff has determined that license renewal for Quad Cities may affect, but is not likely to adversely affect these two species.

### Introduction

The NRC licenses the operation of domestic nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and NRC implementing regulations. Exelon Generation Company, LLC (Exelon) operates Quad Cities pursuant to NRC Operating License Numbers DRP-29 and DRP-30, both of which expire on December 14, 2012.

Exelon has prepared an environmental report in conjunction with its application for renewal of the Quad Cities operating licenses, as provided for by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (CFR), Part 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, Section 54.23, Contents of Application - Environmental Information (10 CFR 54.23)
- Title 10, Energy, CFR, Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, Section 51.53, Postconstruction Environmental Reports, Subsection 51.53(c), Operating License Renewal Stage (10 CFR 51.53(c))

The renewed operating licenses would allow up to 20 additional years of plant operation beyond the current licensed operating period of 40 years.



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No major refurbishment or replacement of important systems, structures, or components are expected during the Quad Cities license renewal period. In addition, no construction activities are expected to be associated with license renewal.

The purpose of this BA is to provide the NRC staff's assessment to the U.S. Fish and Wildlife Service (FWS) concerning the potential impacts of continued operation of Quad Cities on threatened or endangered species and designated critical habitat pursuant to Section 7(a)(2) of the Endangered Species Act. This consultation is between the NRC staff and the FWS.

This BA examines the effects of the Quad Cities operation on Federally listed species that occur in the counties where the Quad Cities site and associated transmission lines are located. The seven Federally listed species that could occur within the Quad Cities site or along its associated transmission lines are listed in Table 1. No designated critical habitat exists for any of the listed species on or in the vicinity of the Quad Cities site or transmission ROWs. No species known from the site or ROWs are proposed for listing or are candidate species.

**Table 1. Species Listed as Endangered or Threatened or Candidates for Listing by the FWS that Occur or Potentially Occur within Rock Island, Whiteside and Lee Counties, Illinois, and Clinton and Scott Counties, Iowa**

Scientific Name	Common Name	Federal Status <sup>1</sup>	County	Habitat <sup>2</sup>
<b>Plants</b>				
<i>Platanthera praeclara</i>	western prairie fringed orchid	T	All	mesic to wet tallgrass prairies and meadows; old fields; roadside ditches
<i>Platanthera leucophaea</i>	eastern prairie fringed orchid	T	All	wet grassland habitats
<i>Lespedeza leptostachya</i>	prairie bush-clover	T	All	dry to mesic prairies
<b>Birds</b>				
<i>Haliaeetus leucocephalus</i>	bald eagle	T	Rock Island, Whiteside, Scott, Clinton	Wintering, breeding (Clinton County)  Open water, riparian, bottomlands

Table 2 (continued)

Scientific Name	Common Name	Federal Status <sup>1</sup>	County	Habitat <sup>2</sup>
<b>Mollusks</b>				
<i>Discus macclintocki</i>	Iowa Pleistocene snail	E	Clinton	algific talus slopes
<i>Lampsilis higginsii</i>	Higgins' eye peartymussel	E	Rock Island, Scott, Clinton	sand/gravel substrates; swift flowing currents
<b>Mammals</b>				
<i>Myotis sodalis</i>	Indiana bat	E	South of Interstate 80 in Iowa and All Counties in Illinois	caves, mines; small stream corridors with well-developed riparian woods; upland and bottomland forests
1. T = Threatened; E = Endangered 2. No designated critical habitat occurs in the counties of concern Source: FWS 2003a and FWS 2003c				

This EA summarizes pertinent project information and existing data, and discusses the potential consequences of the proposed 20-year license renewal on the seven species listed in Table 1 with emphasis on the Higgins' eye peartymussel and the bald eagle.

#### Project Description

The proposed action is the renewal of the operating licenses for Quad Cities. The Quad Cities site is located on the banks of the Mississippi River at river-km 815.1 (river-mi 506.5) and about 32 km (20 mi) northeast of the Quad Cities Metropolitan Area of Davenport and Bettendorf, Iowa; and Rock Island, Moline, and East Moline, Illinois (Figures 1 and 2). The current operating licenses for both Units 1 and 2 expire on December 14, 2012. By letter dated January 3, 2003, Exelon submitted an application to the NRC (Exelon 2003a) to renew these operating licenses for an additional 20 years of operation (i.e., until December 14, 2032).

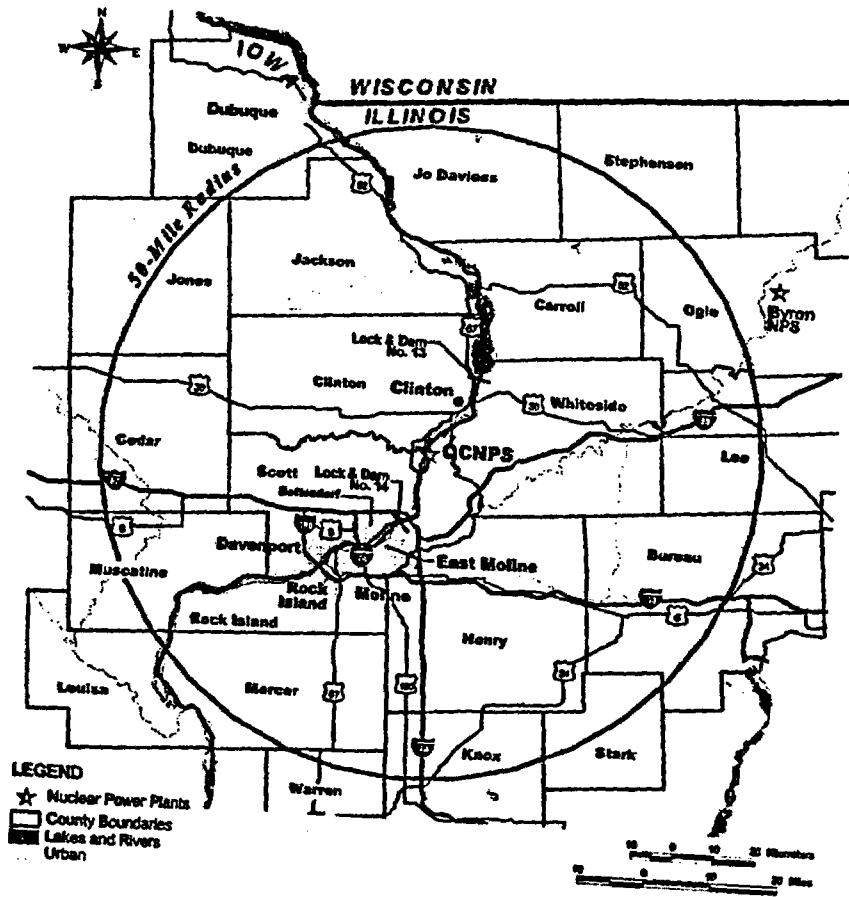


Figure 1. Quad Cities Nuclear Power Station 80-km (50-mi) Region

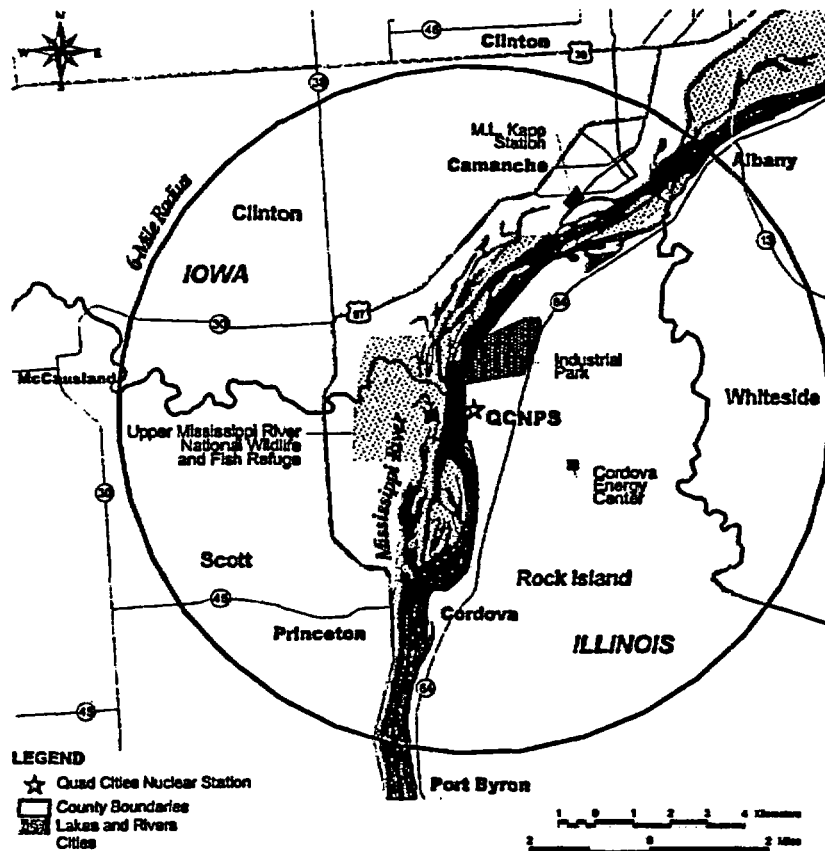


Figure 2. Quad Cities Nuclear Power Station, 10-km (6-mi) Region

In a letter dated March 12, 2003, the NRC staff requested comments from the FWS on the operating license renewal application for Quad Cities. Specifically, the NRC requested a list of species and information on protected, proposed, and candidate species, and any critical habitat, that may be in the vicinity of the Quad Cities plant and its associated transmission lines (NRC 2003a). In response, on June 8, 2003, the FWS provided information regarding

- 6 -

Federally listed species that have been observed or that may occur in the vicinity of the Quad Cities site and its associated transmission lines (FWS 2003a). On August 12, 2003, the NRC staff requested additional information from the FWS for an expanded scope of the transmission lines under review for license renewal (NRC 2003b). The FWS responded on September 15, 2003, with this requested information (FWS 2003c). This information has been reviewed by the NRC staff and is included in this BA.

Exelon also has corresponded with the FWS regarding potential impacts of license renewal on threatened or endangered species (Jury 2002). The FWS indicated that it had no objection to the license renewal action (Miller 2002). Quad Cities is not located near the designated critical habitat of any of the threatened or endangered species discussed in this assessment.

Exelon has no plans to conduct major refurbishment or construction activities at Quad Cities as part of continued operations during the license renewal period; therefore, the proposed project is not a major construction activity (Exelon 2003b).

#### Description of Project Area

##### 1. General Plant and Ecological Resources Information

Quad Cities is owned and operated by Exelon (2003b). It is located in the Upper Mississippi Basin on the Illinois side of the Mississippi River approximately 80-kilometers (50 mi) south of the northern boundary of the State of Illinois and 815.1 river-km (506.5 river-mi) upstream from its confluence with the Ohio River. It is located on the east bank of Pool 14 of the Mississippi River between Lock and Dams 13 and 14 (Figures 1 and 2).

The Quad Cities site is located on moderately high bluffs between 6 m (20 ft) and 12-m (40 ft) above the surface of the river. The site is flat with a grade level of approximately 2.7-m (9 ft) above maximum flood stage. The Quad Cities site features two boiling water reactor units, intake and discharge canals, auxiliary buildings, switchyards, and a spent fuel pool. The site occupies approximately 331 ha (817 ac) of both developed and undeveloped areas. The site also contains a 4.8-km (3-mi) retired spray canal that is now used to raise fish (Exelon 2003b). The developed areas mostly occupy the western half of the site. Undeveloped areas are located generally on the eastern half of the site and support habitats that include open fields and planted pines. Approximately 22 ha (55 ac) are leased for farming (i.e., hay). The surrounding area is rural farmland and woods with an industrial park located 1.6-km (1 mi) north of the site, and the Cordova Energy Center, a gas-fired power plant, located approximately 1.6-km (1 mi) to the southeast. Prior to plant operations, the primary use of the site was agricultural and residential (AEC 1972).

The Quad Cities site is located in an area of sandy soil with little bushy or wooded habitat. The agricultural lands in the vicinity are used for grain and cattle forage crops (AEC 1972). Some of the species (i.e., especially terrestrial mammals) that inhabit areas adjacent to the Quad Cities site probably also use the limited natural areas within the site boundaries. Other important local habitats are nearby river islands and areas adjacent to the river in Scott and Clinton counties in Iowa. These areas, which are generally encompassed by the Upper Mississippi River National Wildlife and Fish Refuge (NWFR) and the Princeton Wildlife Management Area (PWMA),

provide upland and bottomland habitats, including hardwood forests, grasslands, agricultural fields, islands, wetlands, sloughs, lakes, and shoreline (FWS 2003c). Birds (e.g., migratory passerines, raptors, waterfowl, and shorebirds) use the area extensively. The wetlands, forests, and prairies are used by more than 50 species of mammals that include deer, raccoon, muskrat, red and gray fox, coyote, weasel, mink, badger, skunk, river otter, and many other small mammals (FWS 2000c; AEC 1972).

The PWMA, a 482-ha (1190-ac) habitat management unit within the Upper Mississippi River NWFR, was constructed to provide optimum habitat conditions for fish and wildlife species. The water levels within these units are managed to provide emergent vegetation and mud/sand flats to maintain diverse habitat types for many wetland-dependent species (FWS 2000c). Floodplain forest habitats dominate this management area and include such plant species as silver maples, green ash, and cottonwoods. Large numbers of bald eagles live in this area during the winter months as well as waterfowl and migratory passerines (Iowa Bird and Birding 2002).

The principal aquatic resources in the vicinity of the Quad Cities site are associated with the Mississippi River. The transmission lines associated with Quad Cities cross a number of streams, ranging in size from small intermittent streams to the Rock River. The major changes and modifications within the Upper Mississippi River that have had the greatest effect on aquatic resources include: (1) loss of floodplain connectivity due to extensive levee construction, (2) impoundment of the river from construction of locks and dams, (3) river channelization related to navigation, (4) water quality degradation in tributary streams, and (5) invasion of exotic species through man-made navigation projects (Upper Mississippi River Conservation Committee 1993). The main channel of the Upper Mississippi River is periodically dredged in some reaches to maintain the 3-m (9-ft) navigation channel (Fremling and Draskowski 2000). The impacts of contaminants from agricultural, industrial, municipal, and residential sources on river biota are largely unknown (Fremling and Draskowski 2000).

Ninety-two fish species have been collected in Pool 14 of the Mississippi River (Bowzer and Lippincott 2000). The most abundant species include the gizzard shad, common carp, emerald shiner, river shiner, bluegill, and freshwater drum. The most common game species include channel catfish, white bass, pumpkinseed, largemouth bass, white crappie, black crappie, walleye, and sauger (Bowzer and Lippincott 2000). Commercial fisheries also exist for species such as the bigmouth buffalo, common carp, catfish and bullheads, and freshwater drum (FWS 1991). Walleye and hybrid striped bass have increased in Pool 14 due to stocking of these fish by Exelon (Bowzer and Lippincott 2000; LaJeune and Monzingo 2000).

The Upper Mississippi River contains a rich assortment of freshwater mussels. Historically, as many as 50 species have been documented from the Upper Mississippi River, but only about 30 species have been reported in recent surveys (U.S. Geological Survey [USGS] 1999). Mussels are often found in dense aggregations called mussel beds. While these beds may be miles apart, an individual bed can be up to several miles long (USGS 1999). Populations of fingernail clams have declined in certain reaches of the Upper Mississippi River during recent decades. These declines have occurred chiefly during low-flow periods associated with droughts (Fremling and Draskowski 2000). An introduced species, the zebra mussel, became established in the Upper Mississippi River by 1992. The increase in the numbers of this species has caused a decline among many native mussels because zebra mussels can

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out-compete native species for oxygen and food and are so prolific that native mussel beds are smothered (FWS 2001). The zebra mussel has also increasingly displaced other macroinvertebrates, such as hydropsychid caddis flies, that live on submerged hard surfaces (Fremling and Drazkowski 2000).

## 2. Heat Dissipation System

Quad Cities has two General Electric boiling water reactors, with a design rating for net electrical power output of 830 megawatts electric per unit. Plant cooling and auxiliary water systems are provided by a once-through condenser cooling system that withdraws and returns water from and into the Mississippi River. The plant withdraws water from a canal intake structure located along the east side of the river. Quad Cities utilizes a two-pipe diffuser system to return the cooling water to the river. The two pipes are 4.9 m (16 ft) in diameter and lie on the bottom of the river across the main river flow. The combined cooling and service water, with an increase of as much as 15.6°C (28°F) above intake temperature, is discharged into the deepest part of the river through regularly spaced jet nozzles in the diffuser pipes. The total flow of Mississippi River water through Quad Cities for condenser circulating water and service water is approximately 61,000 L/s (970,000 gpm or 2,160 cfs). The temperature increase at the edge of the discharge mixing zone is required to be less than 2.8°C (5°F) above ambient temperature (Illinois Environmental Protection Agency 2000). At Camanche, Iowa, approximately 10 km (6 mi) upstream of the Quad Cities site, the Mississippi River has an annual mean flow of 1,380,000 L/s (48,750 cfs) (USGS 2000). The Wapsipinicon River flows into the Mississippi River from the west immediately upstream of the Quad Cities site, contributing an additional 48,000 L/s (1700 cfs) (USGS 2000), bringing the average river flow at the Quad Cities site to 1,430,000 L/s (50,500 cfs).

## 3. Transmission System

Quad Cities is connected to the transmission system via five transmission lines, totaling approximately 185 km (115 mi) and with ROWs covering approximately 880 ha (2200 ac). These lines traverse mainly agricultural land along with some natural terrestrial habitats (Exelon 2003b; AEC 1972). Approximately 90 to 95 percent of the transmission corridor can be classified as agricultural. The transmission lines are the Davenport line (Line 0401), the Barstow line (Line 0402), the south Nelson line (Line 0403), the north Nelson line (Line 0404), and the Rock Creek line (Line 0405) (Table 2).

Table 2. Quad Cities Transmission Line Corridors

Substation (line)	Number of Lines	kV	Approximate Corridor Length		Corridor (Right-of-Way) Width		Estimated Corridor Area	
			km	(mi)	m	(ft)	ha	ac
Davenport (0401)	1	345	20.8	12.8	55	180	110	280
Barstow (0402)	1	345	28.1 <sup>a</sup>	17.5 <sup>a</sup>	158, 44 <sup>b</sup>	520, 145 <sup>b</sup>	160 <sup>a</sup>	400 <sup>a</sup>
Nelson (South line 0403)	1	345	67.4 <sup>a</sup>	41.9 <sup>a</sup>	158, 44 <sup>b</sup>	520, 145 <sup>b</sup>	330 <sup>a</sup>	830 <sup>a</sup>
Nelson (North line 0404)	1	345	63.9	39.7	44	145	280	700
Rock Creek (0405)	1	345	8.0	5.0	52	170	40	100
<b>Total</b>	<b>5</b>		<b>185.0<sup>a</sup></b>	<b>115.0<sup>a</sup></b>			<b>880<sup>a</sup></b>	<b>2200<sup>a</sup></b>

a. The initial 3.2-km (2 mi) of corridor is shared by Barstow and Nelson South lines. The initial 3.2-km (2 mi) is counted once in the total.

b. The initial 3.2-km (2 mi) of the corridor is 158 m (520 ft) wide.

c. The area includes the area of the shared corridor. The area of the shared corridor is only included once in the total.

Source: Exelon 2003b.

Except for the Upper Mississippi River NWFR and the PWMA, the Quad Cities transmission lines traverse land cultivated for row crops and pasture typical of eastern Iowa and northwestern Illinois.

The Davenport and the Rock Creek transmission corridors are maintained by mowing (Exelon 2003c), trimming, tree removal, and use of approved herbicides (Exelon 2003c; Exelon 2003d). Unless otherwise noted, vegetation management follows a three-year cycle within the Davenport corridor (Exelon 2003c) and a six-year cycle within the Rock Creek corridor (Exelon 2003d). Herbicide application is performed according to label specifications by certified applicators. Pre-activity surveys are not routinely performed for the Davenport and the Rock Creek transmission lines (Exelon 2003c; Exelon 2003d). Line maintenance staff receives training in identifying Federally and State listed species and their habitats that may occur in the vicinity of the Rock Creek line and in procedures to follow if one of these species is encountered during maintenance activities (Exelon 2003d). Line maintenance staff working within the Davenport corridor does not receive similar training (Exelon 2003c).



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**Description of Federally Protected Species Potentially Occurring in the Project Area****1. Indiana Bat (*Myotis sodalis*)**

The Indiana bat was originally listed in 1967 as Federally endangered. Its decline is largely attributed to cave destruction and disturbance (FWS 1991b). The Indiana bat is very small, with a wingspan of 23 to 28 cm (9 to 11 in.) and weighing approximately 9 g (0.3 ounces) (FWS 2003c). In winter, the Indiana bat uses limestone caves or abandoned mines for hibernation, although some hibernate under bridges, in old buildings, or under loose bark and in hollows of trees (FWS 2003c; FWS 1991b). This species forages for insects along stream corridors, within the canopy of floodplain and upland forests, over clearings with early successional vegetation (old fields), along the borders of croplands, along wooded fencerows, and over farm ponds and in pastures. It has been shown that the foraging range for the bats varies by season, age, and sex and ranges up to 33 ha (81 ac) (FWS 2003c). Roosting and rearing of young usually occurs in caves, although it may occur in the loose bark of trees (FWS 1991b). Exelon has not noted any Indiana bats in the vicinity of the Quad Cities site or its associated transmission lines. Undeveloped portions of the Quad Cities site have not been surveyed for the Indiana bat.<sup>(1)</sup> The FWS notes that the bat may occur in all counties in Iowa south of Interstate 80 (FWS 2003c). Interstate 80 is a major east-west highway in Illinois and Iowa approximately 5 miles south of the Quad Cities site. The Iowa Department of Natural Resources did not note any occurrences of threatened or endangered species in the vicinity of the transmission lines associated with Quad Cities (Brandrup 2002). The NRC staff has concluded that the Indiana bat is unlikely to utilize the site or the transmission ROWs on a regular basis, and that license renewal for an additional 20 years will have "no effect" on the listed species.

**2. Iowa Pleistocene Snail (*Discus macclintocki*)**

The Federally endangered Iowa Pleistocene snail was originally listed in July 1978 (43 FR 28932 [FWS 1978]). This small land snail inhabits algalic (i.e., cold producing) talus slopes, within the leaf litter of cool and moist hillsides (FWS 2003c). It breeds from late March to August by laying two-to-six eggs in this leaf litter, with the eggs hatching approximately 28 days later. The snail feeds on fallen leaves of birch and maple trees or dogwood shrubs. Climate change is attributed as the primary cause of long-term decline of this snail although the most immediate threats are from habitat degradation and destruction, human disturbance, and livestock grazing, as well as misapplication of pesticides (FWS 1997; FWS 2002b). The snail has been found in approximately 30 sites in Iowa and Illinois (FWS 2003c) with none noted by Exelon at Quad Cities (Exelon 2003a). Suitable habitat is unlikely to occur at the site or in the immediate vicinity of Quad Cities transmission lines and their corridors, with the majority of traversed land characterized as flat and agricultural (Exelon 2003a). The NRC has determined that license renewal for an additional 20 years will have "no effect" on the listed species.

**3. Western Prairie Fringed Orchid (*Platanthera praeclara*)**

The Federally threatened western prairie fringed orchid was listed as threatened in 1989, along with the eastern prairie fringed orchid (54 FR 39857 [FWS 1989]). It occurs in mesic to wet

(1) Personal communication with Ed Cunningham during Quad Cities site audit, March 12, 2003.

tallgrass prairies and meadows, but is also found in old fields or roadside ditches (FWS 1998; FWS 2003c). The western prairie fringed orchid is restricted to areas west of the Mississippi River and is known to occur in about 75 sites in 8 states (FWS 2003a). The prairie fringed orchids are mostly threatened by conversion of its habitats to cropland and other habitat loss activities. Other threats include invasive species competition, wetland destruction, intensive hay mowing, fire suppression, and overgrazing (FWS 2003c; Herkert 2002). Based on the known distribution of the species, it is unlikely to be found at the Quad Cities site or along the transmission ROWs. The NRC has determined that license renewal for an additional 20 years will have "no effect" on the listed species.

#### 4. Eastern Prairie Fringed Orchid (*Platanthera leucophaea*)

The eastern prairie fringed orchid, listed as threatened in 1989 (54 FR 39857 [FWS 1989]), also occupies mesic to wet tallgrass prairie or grassland habitats (Herkert 2002; FWS 2003c). However, it can also occupy bogs, fens, and sedge meadows (FWS 2003c). This species formerly occurred throughout Illinois yet has been nearly eliminated from all but northeastern Illinois. There are 30 known Illinois populations; no known populations occur in Whiteside County, although it could occur in Rock Island or Lee counties (records for these counties are no longer extant [Herkert 2002]). No occurrences of either species (eastern or western prairie fringed orchid) have been documented for the Quad Cities site or in areas along its associated transmission lines (Exelon 2003a). The NRC has determined that license renewal for an additional 20 years will have "no effect" on the listed species.

#### 5. Prairie Bush-clover (*Lespedeza leptostachya*)

The Federally-listed threatened prairie bush clover (52 FR 781 [FWS 1987]) occurs on dry gravel and sand prairies (Herkert 2002). It is found only in the tallgrass prairie region of four Midwestern states and is currently found at fewer than 40 sites in 23 counties of Iowa, Illinois, Minnesota, and Wisconsin (FWS 2003c), although it could occur throughout Illinois (FWS 2003c). Fourteen known populations occur in Illinois at present with five of these populations protected on public land; none of these known populations occur in Rock Island or Whiteside counties, although a recent record of a population is known for Lee County (Herkert 2002). The decline of the prairie bush clover is primarily due to the historic loss of tallgrass prairie habitat from conversion to agricultural land, and this species tends to only occur presently in areas that escaped plowing due to being too rocky or steep (FWS 2003c). The lack of suitable habitat leads the NRC staff to conclude that this species is not likely to be present at the site or along the transmission ROWs. The NRC has determined that license renewal for an additional 20 years will have "no effect" on the listed species.

#### 6. Higgins' Eye Peartymussel (*Lampsilis higginsii*)

The Federally-listed endangered Higgins' eye peartymussel is only found in the Mississippi River, St. Croix River in Wisconsin, the Wisconsin River, and the Rock River in Illinois. The Higgins' eye peartymussel spawns in late summer, but larvae are retained in the marsupia until they are released during the following spring or summer (FWS 2003c). Fish hosts for the glochidia (larvae) include freshwater drum, largemouth bass, black crappie, sauger, and walleyes (FWS 2003). The Higgins' eye peartymussel most frequently occurs in medium to large rivers with current velocities of about 0.15 to 0.48 m/sec (0.49 to 1.51 ft/sec) and in depths of 1.0 to 6.0 m (3.3 to 19.7 ft) with firm, coarse sand or mud-gravel substrates

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(FWS 2000a, 2001). This species is common to abundant within Pool 14 of the Mississippi River (Bowzer and Lippincott 2000).

No critical habitat has been designated for the Higgins' eye peartymussel. However, ten Essential Habitat Areas for the Higgins' eye peartymussel occur within the Upper Mississippi River watershed. Essential Habitat Areas are locations known to contain reproducing populations of the Higgins' eye peartymussel in association with a healthy and diverse unionid community (e.g., mussel beds) (FWS 1998). An Essential Habitat Area begins approximately 1.6 km (1.0 mi) downstream of Quad Cities, Units 1 and 2 at river-km 813.3 (river-mi 505.5) and continues downstream to river-km 809.3 (river-mi 503.0) at Cordova, Illinois (FWS 2003b).

The only other Essential Habitat Area located downstream of the Quad Cities site (river-km 815.1 or river-mi 506.5) occurs in Pool 15 in the Sylvan Slough at River Miles 485.5 through 486.0. The other Essential Habitat Areas are in upstream Pools 9 and 10 of the Mississippi River, the St. Croix River, and the Wisconsin River (FWS 2003b). Nearly all of the remaining habitat for the Higgins' eye peartymussel within the Mississippi River occurs within the navigation channel.

Suitable host species for the glochidia (mussel larvae) of the Higgins' eye peartymussel include sauger, freshwater drum, largemouth bass, smallmouth bass, walleye, yellow perch (*Perca flavescens*), and black crappie; while marginal host species include bluegill, northern pike (*Esox lucius*), and green sunfish (FWS 2003b). Most of these fish species are common to abundant and widespread; thus, it is doubtful that the presence of fish hosts is a limiting factor affecting the Higgins' eye peartymussel (Rasmussen 1979).

#### 7. Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was originally listed as endangered by the FWS in 1978, but population increases prompted downlisting to threatened status in 1995. Recovery goals for the species have generally been met or exceeded within the species' range. In addition, population trends indicate that the bald eagle has recovered and is neither in danger of extinction nor likely to become in danger of extinction within the foreseeable future throughout all or a significant portion of its range. As a consequence, the bald eagle was proposed for delisting in 1999 (64 FR 36453 [FWS 1999]).

Bald eagles usually occur near large bodies of water, especially rivers, lakes and reservoirs that provide a reliable food source and isolation from human disturbance. Large trees and snags along shorelines are used as perches and nest sites. Bald eagles primarily feed on fish and waterfowl. These habitats and site components are available in the vicinity of the Quad Cities site and along riparian areas traversed by the Davenport and Rock Creek transmission lines.

The bald eagle is a common visitor to the Upper Mississippi River Valley, including the PWMA and the Savanna District of the Upper Mississippi River NWFR. The bald eagle uses the area as a winter migration corridor and for nesting habitat during the summer. From October to March, hundreds of bald eagles congregate in the area to feed on fish, typically near locks and dams or in ice-free backwater areas (FWS 2000b). These attractive winter feeding grounds include open water areas created by the warm water effluents from the Quad Cities plant (FWS 2003a).

The bald eagle also nests at the Savanna District of the Upper Mississippi River NWFR, usually on islands or along backwater shorelines (FWS 2000b). Bald eagles build their nests in large trees near rivers or lakes and often use the same nest year after year. Within the Savanna District, there are seven active (i.e., known) bald eagle nesting territories, and some of these nests have successfully produced young (FWS 2000b). The nearest known bald eagle nest to the Quad Cities site is located at river mile 514.3 on Beaver Island and has been established for over a decade with observed success in producing young. This nest is approximately 11.3-km (7 mi) or 8 river miles north of the Quad Cities site and 7.2-km (4.5 mi) or 5 river miles north of the Rock Creek transmission line. No other known bald eagle nests occur in the vicinity of the Quad Cities site or its associated transmission lines (Dee 2003). Bald eagles are easily observed in the vicinity of the Quad Cities site (Britton 2003) and are known to regularly occur there (Britton 2003). At this time, Exelon and the owners of the transmission lines (and their line maintenance contractors) have not needed to implement the Northern States Bald Eagle Recovery Plan and Management Guidelines (FWS 1983). This recovery plan provides guidance on the management of bald eagle nesting areas (e.g., providing disturbance buffer zones for nest trees, management of habitat and key components, etc.). The NRC staff expects that the owner of the transmission lines, and the line maintenance contractors, will become familiar with this plan and will implement the guidance within this plan if a need arises in the future.

#### Effects of the Proposed Action on Listed Species Occurring in the Project Area

This section presents the anticipated effects of the proposed action on listed species in the vicinity of Quad Cities and its associated transmission lines. As previously discussed, the western fringed orchid, the eastern fringed orchid, the prairie bush-clover, the Indiana bat and the Iowa Pleistocene snail are not known from the site or transmission ROWs and therefore will not be impacted by the continued operation of the facility during the proposed license renewal period. Only the Higgins' eye pearymussel and bald eagle potentially occur in the vicinity of the site and therefore have the potential for adverse impact during the license renewal period. No designated critical habitat exists in the area and, therefore, no impacts to such habitat are anticipated.

##### 1. Higgins' Eye Pearymussel (*Lampsilis higginsii*)

Past actions that have adversely affected the freshwater mussels (including the Higgins' eye pearymussel) within the Upper Mississippi River have included the pearl button and cultivated pearl industries, siltation, chemicals, establishment and maintenance of the 3-m (9-ft) deep navigation channel, commercial and recreational navigation, and introduced species particularly the zebra mussel (*Dreissena polymorpha*) (USG 1999). The FWS (2000a) has determined that the continuation of the current operation and maintenance activities of the 2.7-m (9-ft) navigation channel in the Mississippi River for another 50 years would jeopardize the continued existence of the Higgins' eye pearymussel. Two of the Essential Habitat Areas for the Higgins' eye pearymussel, both located in Wisconsin, are located within the navigation channel (FWS 2000a). However, the major adverse effect would be associated with continuing upstream transport of zebra mussels by barge traffic. Currently, there are no effective ways to control established populations of zebra mussels at the scale required to eliminate their threat to the Higgins' eye pearymussel (FWS 2003c). Reintroductions of the Higgins' eye

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pearlymussel into rivers from which it has been extirpated have been conducted since 2000, but it is too early to determine the success of these reintroductions (FWS 2003c).

The presence of the Higgins' eye pearlymussel in the Essential Habitat Area downstream from the Quad Cities site suggests that the operation of Quad Cities has not adversely affected the species. Relocations of unionids (including Higgins' eye pearlymussels) were required as a condition of a FWS Biological Opinion (Ecological Specialists, Inc. 2002). The mussels were relocated from river mile 504 to approximately river mile 505, which is closer to the Quad Cities site. Walleye are annually released as part of the fish production operation at the Quad Cities site (Bowzer and Lippincott 2000). As previously mentioned, it is one of several suitable host fishes for the glochidia of the Higgins' eye pearlymussel (FWS 2003c). Thus, release of walleye may provide a small benefit to the mussels that occur downstream from the Quad Cities site. However, the Essential Habitat Area at Cordova, Illinois, and the two in Wisconsin that occur within the navigation channel have become severely infested with zebra mussels (FWS 2003c).

The Quad Cities cooling-water intake and discharge are closely monitored under the National Pollutant Discharge Elimination System (NPDES) program. NPDES permit limits are reviewed on a regular basis by state regulatory agencies to ensure the protection of aquatic biota. The heated condenser water is completely mixed with river water and meets the 2.8°C (5°F) criterion within 152-m (500 ft) downstream of the diffuser pipes (LaJeone and Monzingo 2000). Thus, thermal discharges related to the operation of Quad Cities affect a relatively small area of the Mississippi River. The required thermal mixing zone does not exceed 10.5-ha (26 ac). This is only about 0.25 percent of the area of Pool 14. Furthermore, it extends no more than 152 m (500 ft) downstream of the point of discharge. The Cordova (Illinois) Essential Habitat Area for the Higgins' eye pearlymussel is over 1.6-km (1.0 mi) downstream of the Quad Cities site and thermal mixing zone. Therefore, this mussel bed is not affected by thermal discharges from Quad Cities. Also, there are no plans to conduct refurbishment or construction at Quad Cities (Exelon 2003b).

On the basis of the minimal anticipated impacts of cooling water intake and discharge on the Higgins' eye pearlymussel or its habitat, the NRC staff concludes that continued operation of Quad Cities over the 20-year license renewal period is not likely to adversely affect the Higgins' eye pearlymussel.

## 2. Bald Eagle

Bald eagles visit the open water and riparian habitats on or near Quad Cities as well as the Davenport and Rock Creek transmission line corridors during winter migration, and they nest in this area in the summer. Continued operation of Quad Cities could affect bald eagles if plant operations resulted in changes to conditions in the Mississippi River that affected food availability (i.e., the availability of fish or waterfowl), or if the Rock Creek or the Davenport transmission lines presented a hazard to the eagles, or if transmission line vegetation management activities disturbed the eagles or degraded their habitats.

Discharges of heated water to the Mississippi River during plant operations result in warmer water in the outfall area. During the winter, the resulting open water may attract eagles that

would otherwise migrate further south. This additional open water increases food availability for bald eagles during the winter and represents a benefit to eagles.

On the basis of their design, location, and surrounding habitats, the Rock Creek and Davenport transmission lines are unlikely to affect the bald eagle adversely. The Rock Creek transmission line is an 8-km (5-mi) long, 345-kV line. This line runs through the industrial park just north of Quad Cities and then crosses the river into Iowa. Its corridor crosses the Mississippi River and the Savanna District of the Upper Mississippi River NWFR approximately 3-km (2 mi) north of the site (Exelon 2003b). The Rock Creek transmission line crosses only open water and riparian habitats within the Upper Mississippi River NWFR. The NRC staff expects that the owners of the transmission line, and the line maintenance contractors, will ensure all ROW maintenance activities for this transmission line that occur in the refuge will be reviewed and approved by the FWS through the Savanna District Office of the Upper Mississippi River NWFR. The remainder of this line traverses lands cultivated for row crops and pasture typical of eastern Iowa.

The Davenport transmission line is a 20.6-km (12.8-mi) long, 345-kV line. This line crosses the Mississippi River and the Upper Mississippi River NWFR immediately south of the Quad Cities site as it enters Iowa from Illinois. The portion of the Upper Mississippi River NWFR traversed by the Davenport corridor is within the PWMA. The Iowa Department of Natural Resources manages this area under a cooperative agreement with the Savanna District of the Upper Mississippi River NWFR. The portion of the Davenport corridor crossing this area is slightly more than 1.6-km (1 mi) in length. The NRC staff expects that the owners of the transmission line, and the line maintenance contractors, will ensure all ROW maintenance activities for this transmission line that occur in the refuge will be reviewed and approved by the FWS through the Savanna District Office of the Upper Mississippi River NWFR. The transmission line then crosses predominantly agricultural land with the exception of a short passage (less than 0.8-km [0.5 mi]) through dense timber and a shorter crossing through sparse timber.

In addition, many habitats along these transmission lines are not likely to be used by bald eagles because of the level of disturbance and human activities normally associated with these relatively developed and agricultural areas. These conditions substantially reduce or eliminate the probability that bald eagles would accidentally strike the transmission line and be killed or injured. The protected open water and riparian areas associated with the Upper Mississippi River NWFR and the PWMA are likely to be used by bald eagles yet represent a small percentage of the transmission line corridors.

The impacts of transmission lines on birds were analyzed in the Generic Environmental Impact Statement (GEIS) on the effects of nuclear power plant license renewal (NRC 1996). In the GEIS, the NRC concluded that mortality resulting from bird collisions with transmission lines associated with license renewal and an additional 20 years of operation would be of small significance. This conclusion was based on (1) the fact that existing literature does not indicate that collision mortality is high enough to result in population-level effects, and (2) the lack of known instances where nuclear power plant lines affect large numbers of individuals in local areas. Neither Exelon nor the NRC staff is aware of any new or significant information that would change the above evaluation of effects on the bald eagle. Exelon and its contractors are not aware of any bald eagle injuries or mortalities as a result of collisions with the lines.

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No management actions for bald eagle nesting and breeding areas (e.g., those actions recommended by the Management Guidelines and Breeding Areas of the Northern States Bald Eagle Recovery Plan) have been needed along the Quad Cities transmission lines. However, it is expected that the owners of the transmission line, and the line maintenance contractors, would implement such actions upon identification of a nest. Vegetation management staff would coordinate and work closely with the FWS, the Upper Mississippi NWFR's Savanna District, the Illinois Department of Natural Resources, and the Iowa Department of Natural Resources to identify needed management actions and would implement actions needed to protect the bald eagle and its habitat. Additionally, it is expected that the transmission line owner, and its vegetation management contractors, would report any incidences of bald eagle injury or mortality along these transmission lines. No incidents have been reported because neither Exelon nor its contractors have observed any injuries or mortalities to bald eagles in the area of Quad Cities and its transmission lines (MidAmerica 2003; Exelon 2003d; Cunningham 2003; Exelon 2003b).

The NRC staff expects that the transmission line owner, and its contractors, will implement Best Management Practices for protecting the bald eagle and its habitats during vegetation management activities. The transmission line owner, and its vegetation management contractors, are expected to work with the FWS and state agencies to ensure that any maintenance operations for the transmission lines minimize any potential for adverse impacts on the bald eagle. Based on this review, the staff concludes that the continued operation of Quad Cities may affect, but is unlikely to adversely affect, the bald eagle.

#### Conclusion

Exelon has no plans to conduct major refurbishment or construction activities at Quad Cities for continued operations during the license renewal period. The proposed project is not a major construction activity. The proposed project is not located near designated critical habitat of any of the threatened and endangered species discussed in this assessment. Based on information concerning life history and the habitat present at the site and along the transmission ROWs, the continued operation of Quad Cities during the proposed 20-year license renewal period will have "no effect" on the western prairie fringed orchid, the eastern prairie fringed orchid, the prairie bush-clover, the Iowa Pleistocene snail, and the Indiana bat. Additionally the NRC staff has determined that continued operation during the proposed renewal period "may affect", but is "not likely to adversely affect", the Higgins' eye pearl mussel or the bald eagle.

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## Appendix E

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

January 13, 2004

Mr. Maynard Crossland  
Director  
Illinois Historic Preservation Agency  
Preservation Services Division  
One Old State Capitol Plaza  
Springfield, IL 62701

**SUBJECT: QUAD CITIES NUCLEAR POWER STATION LICENSE RENEWAL REVIEW  
(IHPA LOG NO. 020116003WVA)**

Dear Mr. Crossland:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), which is located in Rock Island County, Illinois. Exelon Generation Company, LLC (Exelon) owns 75 percent of QCNPS and MidAmerican Energy Company (MidAmerican) owns the remaining 25 percent. Exelon holds the NRC license to operate the plant, acting for itself and as agent for MidAmerican. As part of its review of the proposed action, the NRC staff has prepared a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The SEIS includes analyses of relevant environmental issues, including potential impacts to historic, archeological and cultural properties from refurbishment activities associated with license renewal, and for the extended period of operation. In accordance with our letter to you of July 1, 2003, a copy of the draft supplement is enclosed. Pursuant to 36 CFR 800.8, we are requesting your comments on the draft supplement and on our preliminary conclusions regarding historic properties.

As stated in our July 1, 2003, letter the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs which may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The staff views the APE for the QCNPS license renewal as including the QCNPS site and the immediate environs.

The NRC staff has conducted an environmental audit at the site, and has reviewed historic and archaeological records. As noted in our July 1, 2003, letter we also contacted fifteen Native American Tribes identified as having potential interest in the proposed undertaking. To date, no comments have been received.

In the context of the National Environmental Policy Act of 1969 under which the draft environmental impact statement was prepared, the NRC staff's preliminary determination is that the impact of license renewal on historical and archaeological resources is SMALL and additional mitigation is not warranted. Under the provisions of the National Historic Preservation Act of 1966, the NRC staff's preliminary determination is that there will be no historic properties affected for the proposed action.


Appendix E

M. Crossland

2

Please note that the period for public comment expires on January 27, 2004. If your office requires additional time, or if there are any other questions regarding this correspondence, please have your representative contact the Environmental Project Manager, Mr. Louis Wheeler, at 301-415-1444 or [DXW@nrc.gov](mailto:DXW@nrc.gov).

Sincerely,

  
Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos.: 50-254, 50-265

Enclosure: As stated

cc w/o Encl: See next page



UNITED STATES  
**NUCLEAR REGULATORY COMMISSION**  
 WASHINGTON, D.C. 20555-0001

January 13, 2004

Ms. Anita Walker  
 Acting State Historic Preservation Officer  
 State Historical Society of Iowa  
 600 East Locust Street  
 Des Moines, IA 50319-0280

**SUBJECT: QUAD CITIES NUCLEAR POWER STATION LICENSE RENEWAL REVIEW  
 (REFERENCE NO. 020482156)**

Dear Ms. Walker:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2 (QCNP), which is located in Rock Island County, Illinois. Exelon Generation Company, LLC (Exelon) owns 75 percent of QCNP and MidAmerican Energy Company (MidAmerican) owns the remaining 25 percent. Exelon holds the NRC license to operate the plant, acting for itself and as agent for MidAmerican. As part of its review of the proposed action, the NRC staff has prepared a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The SEIS includes analyses of relevant environmental issues, including potential impacts to historic, archeological and cultural properties from refurbishment activities associated with license renewal, and for the extended period of operation. In accordance with our letter to you of July 1, 2003, a copy of the draft supplement is enclosed. Pursuant to 36 CFR 600.8, we are requesting your comments on the draft supplement and on our preliminary conclusions regarding historic properties.

As stated in our July 1, 2003, letter the NRC staff has determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs which may be impacted by post-license renewal land disturbing operation or projected refurbishment activities associated with the proposed action. The staff views the APE for the QCNP license renewal as including the QCNP site and the immediate environs.

The NRC staff has conducted an environmental audit at the site, reviewed historic and archaeological records, and has discussed the project with Mr. Douglas W. Jones of your office. These activities identified one site within the existing right-of-way, 13ST157, which has been determined to be ineligible for listing on the National Register of Historic Places (NRHP). We also contacted fifteen Native American Tribes identified as having potential interest in the proposed undertaking. To date, no comments have been received.


In the context of the National Environmental Policy Act of 1969 under which the draft environmental impact statement was prepared, the NRC staff's preliminary determination is that the impact of license renewal on historical and archaeological resources is SMALL and additional mitigation is not warranted. Under the provisions of the National Historic Preservation Act of 1966, the NRC staff's preliminary determination is that there will be no historic properties affected for the proposed action.

A. Walker

2

Please note that the period for public comment expires on January 27, 2004. If your office requires additional time, or if there are any other questions regarding this correspondence, please have your representative contact the Environmental Project Manager, Mr. Louis Wheeler, at 301-415-1444 or [DXW@nrc.gov](mailto:DXW@nrc.gov).

Sincerely,

  
Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Docket Nos.: 50-254, 50-265

Enclosure: As stated

cc w/o Encl.: See next page



United States Department of the Interior



FISH AND WILDLIFE SERVICE  
Rock Island Field Office  
4469 48<sup>th</sup> Avenue Court  
Rock Island, Illinois 61201  
Phone: (309) 793-5800 Fax: (309) 793-5804

IN REPLY REFER  
TO  
FWS/RIFO

January 15, 2004

Mr. Pao-Tsin Kuo, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
Nuclear Regulatory Commission  
Washington, DC 20555-0001

Dear Mr. Kuo:

We have reviewed your December 2003, biological assessment regarding impacts to threatened and endangered species resulting from the Quad Cities Nuclear Power Station, Units 1 and 2 license renewal. The operating license renewal is for an additional 20-year period for the Quad Cities Nuclear Power Station, Units 1 and 2, on the east bank of Pool 14 of the Mississippi River between Lock and Dams 13 and 14, and 815.1-km (506.5 mi) upstream from its confluence with the Ohio River. We have the following comments.

No construction, refurbishment, or replacement activities are associated with the license renewal. Therefore, we concur with your findings that the proposed project is not likely to adversely affect federally listed threatened and endangered species. Should the project be modified or new information indicate endangered species may be affected, consultation should be initiated.

Thank you for the opportunity to comment. If you have any additional questions or concerns, please contact Heidi Woerber of my staff.

Sincerely,



Richard C. Nelson  
Supervisor

GA\Office Users\Held\nerconcur.doc



**Illinois Historic  
Preservation Agency**

1 Old State Capitol Plaza • Springfield, Illinois 62701-1507 • Teletypewriter Only (217) 524-7126

Voice (217) 782-4838

Various Counties

Rock Island & Whiteside Counties

Quad Cities Nuclear Power Plant Stations/Units 1 & 2 License Renewal (Old

PrjID: 0201160038NVA)

Transmission lines are located in Rock Island & Whiteside County

INFA Log #036011602

February 26, 2004

Pao-Tsin Kuo  
United States Nuclear Regulatory Commission  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Washington, DC 20555-0001

Dear Mr. Kuo:

We have reviewed the Generic EIS for License Renewal of Nuclear Plants, dated November 2003, submitted for the above referenced project(s) in accordance with 36 CFR Part 800.4. Based upon the information provided, we concur that no historic properties are affected. We, therefore, have no objection to the undertaking proceeding as planned.

Please retain this letter in your files as evidence of compliance with section 106 of the National Historic Preservation Act of 1966, as amended. This clearance remains in effect for two years from date of issuance. It does not pertain to any discovery during construction, nor is it a clearance for purposes of the Illinois Human Skeletal Remains Protection Act (20 ILCS 3440).

If you have any further questions, please contact Cody Wright, Cultural Resources Manager, Illinois Historic Preservation Agency, 1 Old State Capitol Plaza, Springfield, IL 62701, 217/785-3977.

Sincerely,

*Anne E. Haaker*

Anne E. Haaker  
Deputy State Historic  
Preservation Officer

AEH





A Division of the Iowa Department of Cultural Affairs

February 26, 2004

Pao-Tsin Kuo, Program Director  
License Renewal & Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

1/13/03  
65724372  
14

In reply refer to:  
R&C#: 020482155

Rules and Directives  
Branch  
SNRC

2004 MAR 12 PM 3:33

RECEIVED

RE: NRC - SCOTT COUNTY - RS-02-079 - QUAD CITIES NUCLEAR POWER STATION  
UNITS 1 & 2 LICENSE RENEWAL - POWER STATION LICENSE RENEWAL REVIEW -  
DRAFT REPORT FOR COMMENT - GENERIC ENVIORNMENTAL IMPACT  
STATEMENT FOR LICENSE RENEWAL OF NUCLEAR PLANTS - SUPPLEMENT 16

Dear Mr. Pao-Tsin Kuo,

We have received the submitted Supplemental Environmental Impact Statement (SEIS) to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS, NUREG-1437). Based on a review of this document, we concur with your determination of No Historic Properties Affected for this proposed undertaking under the Section 106 of the National Historic Preservation Act of 1966 and that the impact of license renewal on historical and archaeological resources is small and no mitigation is warranted under the National Environmental Policy Act of 1969.

We have made these comments and recommendations according to our responsibility defined by Federal law pertaining to the Section 106 process. If design changes are made for this project which would involve undisturbed new rights-of-way or easements, please forward additional information to our office for further comment along with your determination of effect. If project activities uncover an item(s) that might be of archeological, historical or architectural interest, or if important new archeological, historical or architectural data should be encountered in the project APE, the contractor should make reasonable efforts to avoid further impacts to the property until an assessment can be made by an individual meeting the appropriate Secretary of the Interior standards for the identified resource.

Should you have any questions please contact me at the number below.

Sincerely, *Douglas W. Jones*  
Douglas W. Jones, Archaeologist  
Historic Preservation Bureau  
State Historical Society of Iowa  
(515) 281-4358

cc: Rosetta O. Virgilio, Federal Preservation Officer, U.S. Nuclear Regulatory Commission  
Louis Wheeler, Env. Project Manager, US Nuclear regulatory Commission

*Sample to ADL-013*

*E-EDS-ADM-03*

600 EAST LOCUST STREET, DES MOINES, IA 50319-0290 P: (515) 281-3111

*Call = J. Wheeler (DWS)*

## **Appendix F**

### **GEIS Environmental Issues Not Applicable to Quad Cities Units 1 and 2**

## Appendix F

### GEIS Environmental Issues Not Applicable to Quad Cities Units 1 and 2

Table F-1 lists those environmental issues listed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)* (NRC 1996; 1999)<sup>(a)</sup> and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are not applicable to Quad Cities Units 1 and 2 because of plant or site characteristics.

**Table F-1. GEIS Environmental Issues Not Applicable to Quad Cities Units 1 and 2**

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
<b>SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)</b>			
Altered salinity gradients	1	4.2.1.2.2 4.4.2.	The Mississippi River is an inland freshwater river with no salinity gradient.
Altered thermal stratification of lakes	1	4.2.1.2.3 4.4.2.2	The Quad Cities plant has a once-through cooling system that discharges directly to a river.
Water use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	2	4.3.2.1 4.4.2.1	The Quad Cities plant has a once-through cooling system that discharges directly to a river.
<b>AQUATIC ECOLOGY (FOR PLANTS WITH COOLING-TOWER-BASED HEAT DISSIPATION SYSTEMS)</b>			
Entrainment of fish and shellfish in early life stages	1	4.3.3	This issue is related to heat dissipation systems that are not installed at Quad Cities.
Impingement of fish and shellfish	1	4.3.3	This issue is related to heat dissipation systems that are not installed at Quad Cities.
Heat shock	1	4.3.3	This issue is related to heat dissipation systems that are not installed at Quad Cities.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

Appendix F

Table F-1 (contd)

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
<b>GROUND-WATER USE AND QUALITY</b>			
Ground-water use conflicts (potable and service water, and dewatering; plants that use > 100 gpm)	1	4.8.1.1 4.8.1.2	Quad Cities uses more than 100 gpm of groundwater.
Ground-water use conflicts (plants using cooling towers withdrawing make-up water from a small river)	2	4.8.1.3	This issue is related to heat dissipation systems that are not installed at Quad Cities.
Ground-water-use conflicts (Ranney wells)	2	4.8.1.4	Quad Cities Units 1 and 2 do not have or use Ranney wells.
Ground-water quality degradation (Ranney wells)	1	4.8.2.2	Quad Cities Units 1 and 2 do not have or use Ranney wells.
Ground-water quality degradation (saltwater intrusion)	1	4.8.2.1	The Mississippi River is an inland freshwater river with no salinity gradient.
Ground-water quality degradation (cooling ponds in salt marshes)	1	4.8.3	This issue is related to heat dissipation systems that are not installed at Quad Cities.
Ground-water quality degradation (cooling ponds at inland sites)	2	4.8.3	This issue is related to heat dissipation systems that are not installed at Quad Cities.
<b>TERRESTRIAL RESOURCES</b>			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to heat dissipation systems that are not installed at Quad Cities.
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to heat dissipation systems that are not installed at Quad Cities Units 1 and 2.
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to heat dissipation systems that are not installed at Quad Cities Units 1 and 2.
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to heat dissipation systems that are not installed at Quad Cities.

## F.1 References

10 CFR Part 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*, "Section 6.3 – Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

## **Appendix G**

### **NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Quad Cities Nuclear Power Station, Units 1 and 2, In Support of License Renewal Application**

## Appendix G

### **NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Quad Cities Nuclear Power Station, Units 1 and 2, in Support of License Renewal Application**

#### **G.1 Introduction**

Exelon Generation Company, LLC (Exelon) submitted an assessment of SAMAs for Quad Cities as part of the ER (Exelon 2003a). This assessment was based on the most recent Quad Cities Probabilistic Risk Assessment (PRA) available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2), and insights from the Quad Cities Individual Plant Examination (IPE) (ComEd 1996a & b) and Individual Plant Examination of External Events (IPEEE) (ComEd 1997). In identifying and evaluating potential SAMAs, Exelon considered SAMA analyses performed for other operating plants which have submitted license renewal applications, as well as industry and NRC documents that discuss potential plant improvements, such as NUREG-1560 (NRC 1997a). Exelon identified 280 potential SAMA candidates. This list was reduced to 15 unique SAMA candidates by eliminating SAMAs that were not applicable to Quad Cities due to design differences, had already been implemented, or had high implementation costs. (A set of 14 candidate SAMAs is identified in the ER. One additional SAMA that was originally identified for retention was omitted and subsequently identified and addressed while responding to a staff request for additional information.) Exelon assessed the costs and benefits associated with each of the potential SAMAs and concluded that none of the candidate SAMAs evaluated would be cost-beneficial for Quad Cities.

Based on a review of the SAMA assessment, the NRC issued a request for additional information (RAI) to Exelon by letter dated May 23, 2003 (NRC 2003). Key questions concerned: dominant risk contributors at Quad Cities and the SAMAs that address these contributors, the potential impact of external event Initiators and uncertainties on the assessment results, and detailed information on some specific candidate SAMAs. Exelon submitted additional information by letter dated July 17, 2003 (Exelon 2003b). In the response, Exelon provided tables containing importance measures for various events and their relationship to evaluated SAMAs; rationale for why the core damage frequency (CDF) for fire events would be substantially lower than reported in the IPEEE; results of a revised screening based on consideration of the potential impact of external events and uncertainties; more realistic estimates of the benefits and implementation costs for seven SAMAs that appeared to be cost-beneficial based on the revised screening; and the costs and benefits associated with several lower cost alternatives. Exelon's responses addressed the staff's concerns and reaffirmed that none of the SAMAs would be cost-beneficial. Despite the fact that Exelon

determined that there were no cost-beneficial SAMAs, Exelon stated that they plan to implement a modification to provide alternative air supplies in the case of failure of instrument air (Phase 2 SAMA 17).

Based on its review, the staff concluded that the contribution to risk from fire events would be higher than assumed in Exelon's SAMA analysis. The staff adjusted Exelon's risk reduction estimates to account for the contribution to risk (and risk reduction) from fire events, and found that four of the candidate SAMAs would be cost-beneficial and two additional SAMAs are close to being cost-beneficial, and could be cost-beneficial given a more detailed assessment of their benefits in external events, or when uncertainties are taken into account. However, these six SAMAs do not relate to adequately managing the effects of aging during the period of extended operation, and therefore need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

An assessment of SAMAs for Quad Cities is presented below.

## **G.2 Estimate of Risk for Quad Cities**

Exelon's estimates of offsite risk at Quad Cities are summarized in Section G.2.1. The summary is followed by the staff's review of Exelon's risk estimates in Section G.2.2.

### **G.2.1 Exelon's Risk Estimates**

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the Quad Cities Level 1 and 2 PRA model, which is an updated version of the "Updated" (IPE) (ComEd 1996a and 1996b), and (2) a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PRA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent Level 1 and 2 PRA model available at the time of the ER, referred to as the 2002B model (or Update Revision 02B). The scope of the Quad Cities PRA does not include external events.

The baseline CDF for the purpose of the SAMA evaluation is approximately  $2.2 \times 10^{-6}$  per year, and the baseline large early release frequency (LERF) is approximately  $2.7 \times 10^{-7}$  per year. The CDF and LERF are based on the risk assessment for internally-initiated events. Although there have been several PRA revisions since the time of the IPE, the CDF for the 2002B model is coincidentally the same as the value reported in the Updated IPE. Exelon did not include the contribution to risk from external events within the Quad Cities risk estimates, nor did it account for the potential risk reduction benefits associated with external events in the SAMA screening process described in the ER. It is Exelon's position that the existing fire and IPEEE programs have already addressed potential plant improvements related to these areas (Exelon 2003a). In response to an RAI, Exelon performed a separate assessment of the impact on the results if



the SAMA benefits (for internal events) were increased to account for additional benefits in external events. This is discussed further in Sections G.4 and G.6.2.

The breakdown of CDF by initiating event/accident type is provided in Table G-1. As shown in this table, loss of the 125-V DC buses, loss of offsite power, transients (such as turbine trip, loss of turbine building closed cooling water, and loss of condenser vacuum), and loss of service water are dominant contributors to the CDF. Bypass events contribute one percent to the total internal events CDF.

**Table G-1. Quad Cities Core Damage Frequency**

<b>Initiating Event/Accident Class</b>	<b>CDF (Per Year)</b>	<b>% Contribution to CDF</b>
Loss of 125-V DC Buses 1 and 2	$7.6 \times 10^{-7}$	35
Loss of Offsite Power (LOOP) <sup>1</sup> (dual-unit and single-unit)	$4.2 \times 10^{-7}$	19
Transients	$3.2 \times 10^{-7}$	15
Loss of Service Water	$3.0 \times 10^{-7}$	14
Loss-of-Coolant Accident (LOCA)	$1.5 \times 10^{-7}$	7
Loss of Instrument Air	$6.8 \times 10^{-8}$	3
Manual Shutdown	$6.6 \times 10^{-8}$	3
Others	$6.0 \times 10^{-8}$	3
Interfacing Systems LOCA (ISLOCA)	$2.3 \times 10^{-8}$	1
<b>Total CDF (from Internal events)</b>	<b><math>2.2 \times 10^{-6}</math></b>	<b>100</b>

<sup>1</sup>Includes station blackout (SBO)

The Level 2 PRA model has been updated since the IPE. During 1999, Exelon revised the PRA to include a simplified LERF methodology as described in NUREG/CR-6595 (NRC 1999a). In 2002, Exelon replaced the simplified LERF model with a full Level 2 PRA. The source terms were also updated to account for the extended power uprate which was approved by the NRC in 2001 (NRC 2001b). The conditional probabilities, fission product release fractions, and release characteristics associated with each release category were provided in response to an RAI (Exelon 2003b).

## Appendix G

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for this analysis include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution (within a 80 km [50-mi] radius) for the year 2032, emergency response evacuation modeling, and economic data.

In the ER, Exelon estimated the dose to the population within 80 km (50 mi) of the Quad Cities site to be approximately 0.0167 person-Sv (1.67 person-rem) per year. The breakdown of the total population dose by containment release mode is summarized in Table G-2.

**Table G-2. Breakdown of Population Dose by Containment Release Mode**

Containment Release Mode	Population Dose	
	(Person-Rem <sup>a</sup> Per Year)	% Contribution
Early containment failure	0.93	56
Late containment failure	0.67	40
Containment Bypass	0.07	4
No Containment Failure	~0	~0
<b>Total</b>	<b>1.67</b>	<b>100</b>

<sup>a</sup>One person-Rem = 0.01 person-Sv

### G.2.2 Review of Exelon's Risk Estimates

Exelon's determination of offsite risk at Quad Cities is based on the following three major elements of analysis:

- the Level 1 and 2 risk models that form the bases for the 1996 "Modified" and "Updated" IPE submittals (ComEd 1996a and 1996b) and the 1997 IPEEE submittal (ComEd 1997),
- the major modifications to the IPE model that have been incorporated in the Quad Cities PRA, and
- the MACCS2 analyses performed to translate fission product release frequencies from the Level 2 PRA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of Exelon's risk estimates for the SAMA analysis, as summarized below.

The staff's review of the Quad Cities IPE is described in an NRC report dated November 9, 1995 (NRC 1995). Based on a review of the original IPE submittal, the staff could not reach the conclusion that Commonwealth Edison had met the intent of Generic Letter 88-20 (NRC 1988). By letter dated August 30, 1996, Commonwealth Edison submitted a "Modified" IPE (ComEd

1996a), and in December 1996, an "Updated" IPE was submitted (ComEd 1996b). The staff's review of the Modified and Updated IPEs is documented in a letter dated July 9, 1997 (NRC 1997b). In that review, the staff focused on whether the licensee addressed the concerns documented in the November 9, 1995, staff evaluation. The staff concluded that Modified and Updated IPE submittals met the intent of Generic Letter 88-20; that is, the Updated IPE was of adequate quality to be used to look for design or operational vulnerabilities.

The Updated IPE CDF, which included internal floods, was reported to be  $2.2 \times 10^{-6}$  per year. The PRA used in the SAMA analysis indicates no increase in the total CDF of  $2.2 \times 10^{-6}$  per year; however, the current PRA model does not include internal floods. A separate analysis was completed which yielded a flooding CDF of  $4.67 \times 10^{-7}$  per year, which is approximately 18-percent of the total internal events CDF (Exelon 2003b). The total internal events CDF, including internal floods, is slightly higher than what was reported in the Updated IPE. Since the time of the Updated IPE, there have not been any significant plant hardware changes at Quad Cities, with the exception of changes related to the extended power uprate (EPU). These changes are summarized in response to an RAI (Exelon 2003b). A summary listing of the notable PRA changes was provided in the ER and in response to an RAI (Exelon 2003a, 2003b), and include:

- updated initiating event frequencies utilizing Quad Cities most recent operating experience,
- revised offsite AC power recovery,
- revised human reliability analysis, especially to include dependent operator actions,
- revised anticipated transients without scram (ATWS) event trees to make consistent with standard boiling water reactor (BWR) practice, and revised mechanical and electrical ATWS probabilities based on NUREG/CR-5500 (NRC 1999b)
- revised model for EPU plant configuration and MAAP 4.0.4 computer code analysis,
- updated maintenance unavailability data and individual component random failure probabilities, and revised common cause failure calculations using NUREG/CR-5497 (NRC 1998c) and NUREG/CR-5485 (NRC 1998d),
- revised LOOP/dual-unit LOOP analysis for initiating event frequencies and non-recovery probabilities, and
- credited repair/recovery of residual heat removal for long term loss of decay heat removal events.

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The CDF value for Quad Cities is at the lower end of the range of the CDF values reported in the IPEs for other BWR 3/4 plants. Figure 11.2 of NUREG-1560 shows that the IPE-based total internal events CDF for BWR 3/4 plants ranges from  $1 \times 10^{-6}$  to  $8 \times 10^{-5}$  per year (NRC 1997a). It is recognized that other plants have reduced values for CDF subsequent to the IPE submittals due to modeling and hardware changes. The current internal events CDF results for Quad Cities remain comparable to other plants of similar vintage and characteristics.

The staff considered the peer reviews performed for the Quad Cities PRA, and the potential impact of the review findings on the SAMA evaluation. In response to an RAI, Exelon described the previous peer reviews, the most significant of which was the Nuclear Energy Institute (NEI)/Boiling Water Reactor Owners Group (BWROG) Peer Review/Certification conducted in the Fall of 1999 (Exelon 2003b). The NEI/BWROG review of 1999 PRA model concluded that the Quad Cities PRA is consistent with other industry PRAs in scope, methods, data usage, and results. In response to a follow-up question, Exelon indicated that all suggestions for improvement were evaluated for potential impact on risk results. Many of the items were implemented as noted in the RAI response. Those that were deferred or otherwise dispositioned were assessed and determined to have only a minor impact on risk.

One recommendation that was not addressed was that a capability to model uncertainties be added to the model and uncertainty analyses be performed. In an RAI, the staff requested that Exelon provide an estimate of the uncertainties associated with the internal events CDF, and an assessment of the impact on the Phase 1 screening and Phase 2 evaluation if the risk reduction estimates are increased to account for uncertainties (NRC 2003). In response to this request, Exelon estimated the uncertainties based on a review of other plants' CDF uncertainty distributions (Exelon 2003b). Exelon's evaluation and results are discussed in further detail in Section G.4 and G.6.2.

Given that the Quad Cities PRA has been peer reviewed and the peer review findings were either addressed or judged to have no impact on the SAMA evaluation, and that Exelon satisfactorily addressed staff questions regarding the PRA, the staff concludes that the Level 1 PRA model is of sufficient quality to support the SAMA evaluation.

Exelon submitted an IPEEE in February 1997 (ComEd 1997), in response to Supplement 4 of Generic Letter 88-20. The initial fire analysis portion of the Quad Cities IPEEE identified potential fire vulnerabilities which resulted, in part, from the lack of separation of redundant equipment, the complex operator actions for fire recovery, and the reliance on opposite unit equipment to shut down the affected unit. The associated fire CDF was estimated to be about  $5.4 \times 10^{-3}$  per year for Unit 1 and about  $5.2 \times 10^{-3}$  per year for Unit 2. During the IPEEE review, the staff identified discrepancies between the safe shutdown analysis and the post-fire safe shutdown procedures. These issues led to a shutdown of both units in 1997. The NRC issued a confirmatory action letter on January 16, 1998, to document the licensee's commitments

related to resolving the safe shutdown issues (NRC 1998a). The NRC closed the confirmatory action letter by letter dated May 22, 1998 (NRC 1998b). By letter dated July 29, 1999, the licensee submitted a revised fire analysis which reflected its resolution of the safe shutdown issues and included other changes to the fire model. In the revised analysis, the CDFs were reduced to about  $6.6 \times 10^{-5}$  per year for Unit 1 and about  $7.13 \times 10^{-5}$  per year for Unit 2 (ComEd 1999). The revised fire analysis also concluded that there are no potential fire vulnerabilities.

Based on the staff safety evaluation of the Quad Cities IPEEE, the differences between the original and revised analyses were mostly due to more detailed and realistic information on cable routing, a revised fire initiation frequency evaluation, the use of the safe-shutdown model, and the use of a fire propagation model. The revised analysis showed that more equipment would be available for safe-shutdown, and recovery actions could be performed using plant emergency operating procedures with most operator actions taken in the main control room. In a letter dated April 26, 2001, (NRC 2001a), the staff concluded that the submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities.

The Quad Cities fire analysis employed the Fire Induced Vulnerability Evaluation methodology for screening of compartments and Electric Power Research Institute's (EPRI) Fire PRA Implementation Guide (EPRI 1995) for detailed evaluation of the unscreened compartments. The licensee's overall approach in the IPEEE fire analysis is similar to other fire analysis techniques, employing a graduated focus on the most important fire zones using qualitative and quantitative screening criteria. The fire zones or compartments were subjected to at least two screening stages. In the first stage, a zone was screened out if it was found to not contain any safety-related equipment. In the second stage, a CDF criterion of  $1 \times 10^{-6}$  per year was applied. Plant information gathered for compliance with Appendix R to 10 CFR Part 50 was extensively used in the fire IPEEE. The licensee used the IPE model of internal events to quantify the CDF resulting from a fire initiating event. The conditional core damage probability was based on the equipment and systems unaffected by the fire. Initially, all fire event sequences were quantified assuming all equipment/cables in the area would fail by the fire. The CDF for each zone was obtained by multiplying the frequency of a fire in a given fire zone by the conditional core damage probability associated with that fire zone. The screening methodology applied by the licensee makes less and less conservative assumptions (e.g., equipment that may survive the fires in the area) until a fire zone is screened out, the results do not indicate a vulnerability, or a vulnerability is identified and addressed. After the screening, eight compartments remained for Unit 2 that contributed more than the screening value of  $1.0 \times 10^{-6}$ ; similar results were obtained for Unit 1. These compartments are:

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<u>Zone Description (fire area)</u>	<u>CDF</u>
Turbine Room	$2.28 \times 10^{-5}$
Cable vault or tunnel	$1.12 \times 10^{-5}$
Main control room	$1.00 \times 10^{-5}$
Mezzanine floor	$3.43 \times 10^{-6}$
Turbine building ground floor	$3.52 \times 10^{-6}$
Switchgear room	$3.20 \times 10^{-6}$
Direct current (DC) panel room	$2.23 \times 10^{-6}$
Cable spreading room	$1.05 \times 10^{-6}$

Given that the fire CDF ( $7.13 \times 10^{-5}$  per year) is about a factor of 30 greater than the internal events CDF ( $2.2 \times 10^{-6}$  per year), the staff inquired why Exelon neither considered fire explicitly in the SAMA study nor considered the impact of fire CDF in its uncertainty assessment. In a RAI (NRC 2003), the staff asked Exelon to explain, for each fire area, what measures were taken to further reduce risk, and explain why these CDFs can not be further reduced in a cost-beneficial manner. While not explicitly addressing the fire areas, Exelon did list plant improvements that arose from insights from the fire study (Exelon 2003b). These included: improvements to the response time of the sprinkler heads in the reactor feedwater pump areas, yielding a 25% reduction in the fire CDF, and a planned improvement to the containment vent system by providing an alternate or redundant air supply for the containment vent valves, yielding a 17% reduction in the fire CDF (see Section G.6.2 for further discussion of this plant improvement.)

Exelon also noted that 14 other potential plant modifications were analyzed for fire CDF reduction. These modifications were principally developed based on deterministic Appendix R evaluations to enhance Appendix R compliance efforts. A majority of the modifications (nine) were shown to have less than a one-percent reduction in the fire CDF. For three of the modifications, a fire CDF risk reduction was not directly available. These enhancements were related to rerouting a feed to a 125-V DC bus, providing control room or alternate local control station access for select residual heat removal and reactor core isolation cooling valves, respectively. Exelon did not pursue these modifications due to the extensive design engineering and analysis work that would be needed, and because the actual benefit could not be readily measured. For two other modifications, the risk reduction was qualitatively determined to have a minimal risk benefit. These modifications included installation of relays and fuses to improve 125-V DC control power availability for 4-kV and 480-V switchgear, respectively. Although Exelon did not perform a quantitative assessment for those modifications, SAMAs 6 and 8 address bypassing major DC buses, locally starting equipment, and controlling feedwater when 125-V DC is lost; therefore, these SAMAs would be expected to provide risk reduction benefits in fire events. Based on the revised fire analyses, the staff has not identified any fire-related vulnerabilities and thus, no additional SAMAs have been identified besides those identified by the licensee that would specifically address fire-related risks.

Exelon also described three areas in which it believes significant conservatism exists in the fire CDF estimates -- initiating event frequencies, system response/fire modeling, and human reliability modeling. Removal of or reduction in the conservatism in these areas would result in a reduction of the fire CDF to about  $6 \times 10^{-6}$  per year which is a factor of three greater than the internal events CDF (Exelon 2003b). Exelon accounted for the contribution from external events, as well as internal flooding and uncertainty, by applying a multiplier of five to the averted cost estimates reported in the ER. Exelon characterized the result as an "upper bound averted cost estimate" (Exelon 2003b). The staff's review is described in Section G.6.2. In that review, the staff concluded that the contribution to risk from fire events could be larger than assumed in Exelon's upper bound estimate, and accordingly used a higher multiplier in its assessment of potential SAMAs.

The IPEEE uses a focused scope EPRI seismic margins analysis. This method is qualitative and does not provide the means to determine the numerical estimates of the CDF contributions from seismic initiators. The licensee expanded its Unresolved Safety Issue A-46 (NRC 1987) program to include all equipment and components on the IPEEE safe shutdown equipment list, which was developed using the EPRI seismic margins analysis methodology for the primary and secondary shutdown paths. All equipment in the seismic IPEEE scope was reviewed per procedures from the Unresolved Safety Issue A-46 program. After the resolution of the seismic outliers, Exelon estimated the plant's high confidence low probability of failure (HCLPF) to be at least 0.24g peak ground acceleration, which is less than the 0.3g review level earthquake used in the IPEEE. The plant HCLPF was originally assessed to be 0.09g. The staff estimates that if the HCLPF capacity is increased from 0.24 g to 0.3g, the resulting CDF would be reduced by about  $2 \times 10^{-6}$  per year. A reduction of this magnitude would have a benefit of approximately \$100K. Based on this estimation, the staff requested that Exelon confirm that all improvements addressing seismic outliers listed in Table 2.7 of NUREG-1742 (NRC 2002a) had been implemented and that Exelon identify the systems, structures, and components that limit the plant HCLPF and explain why modifications to increase seismic capacity would not be cost-beneficial when evaluated consistent with the regulatory analysis guidelines (NRC 2003). In its response, Exelon stated that all the outliers listed in NUREG-1742 (e.g., enhancing anchorage/support capacity) had been resolved (Exelon 2003b). Furthermore, Exelon listed the Systems, structures, and components that had a HCLPF value of 0.24g or higher but had not been verified to 0.3g (examples are 4 categories of cable trays, a 125V battery charger, three residual heat removal service water pump room coolers, and 22 motor control centers), and estimated that changes required to address these items would be in excess of \$2M. This value is based on EPRI estimates of the costs to implement less extensive Seismic Qualification Utility Group modifications at other plants. The staff concludes that the opportunity for seismic-related SAMAs has been adequately explored and that there are no cost-beneficial, seismic-related SAMA candidates.

The Quad Cities IPEEE evaluated high winds, floods and other events using the progressive screening approach recommended in NUREG-1407 (NRC 1991). Based on this evaluation, the

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licensee determined that the risk from high winds, floods and other events was negligible. Additionally, the Quad Cities IPEEE demonstrated that transportation and nearby facility accidents were not considered to be significant vulnerabilities at the plant.

The staff reviewed the process used by Exelon to extend the containment performance (Level 2) portion of the PRA to an assessment of offsite consequences (essentially a Level 3 PRA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release category and the major input assumptions used in the offsite consequence analyses. The MACCS2 code was utilized to estimate offsite consequences. Plant-specific input to the code includes the Quad Cities reactor core radionuclide inventory, source terms for each release category, emergency evacuation modeling, site-specific meteorological data, and projected population distribution within a 80-km (50-mi) radius for the year 2032. This information is provided in Appendix F of the ER (Exelon 2003a).

Exelon characterized the releases for the spectrum of possible radionuclide release scenarios using a set of 10 release categories, defined based on the timing and magnitude of the release. Two of the categories were combined with other categories, resulting in the use of only eight release categories. Each end state from the Level 2 analysis is assigned to one the release categories. The process for assigning accident sequences to the various release categories and selecting a representative accident sequence for each release category was described in response to RAIs (Exelon 2003b and 2003c). The release categories and their frequencies are presented in Table 4-5 of the ER (Exelon 2003a). Table 3-4 of the response to an RAI provides a break out of the source term by release category (Exelon 2003b). The source terms used for the SAMA evaluation have been updated since the Updated IPE to account for the EPU and are based on the MAAP 4.0.4 computer code. The staff concludes that the assignment of release categories and source terms is consistent with typical PRA practice and acceptable for use in the SAMA analysis.

The core inventory input used in the MACCS2 was obtained from the MACCS2 User's Guide and corresponds to the end-of-cycle values for a 3,578 MW(t) BWR plant. A scaling factor of 0.8264 was applied to provide a representative core inventory of 2,957 MW(t) for Quad Cities (the uprated power level). All releases were modeled as occurring at ground level. The staff questioned the non-conservatism of this assumption and requested an assessment of the impact of alternative assumptions (e.g., releases at a higher elevation). In response to the RAI, Exelon reassessed the doses for all eight release categories assuming that all plumes originated from the top of the reactor building. The results showed that the 50-mile population dose could increase by up to about 12 percent (Exelon 2003b), which equates to approximately a 5.6 percent increase in the maximum attainable benefit. This small increase has a negligible impact on the analysis and its results.



Exelon used site-specific meteorological data, obtained from the plant meteorological tower, processed from hourly measurements for the 2000 calendar year as input to the MACCS2 code. Data from this year was selected because it contained the fewest data voids. Data voids were filled with data from other tower measurements for smaller gaps and from the Quad Cities Airport tower for larger gaps. The staff notes that previous SAMA analyses results have shown little sensitivity to year-to-year differences in meteorological data and considers use of the 2000 data in the base case to be reasonable.

The population distribution the applicant used as input to the MACCS2 analysis was estimated for the year 2032, based on the NRC geographic information system for 1990 (NRC 1997c), and the population growth rates were based on 2000 county-level census data (USCB 2001). The staff considers Exelon's methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 km (10 mi) from the plant. It was assumed that 95 percent of the population would move at an average speed of approximately 1.07 meters per second (2.4 miles/hour) with a delayed start time of 15 minutes (Exelon 2003a). This assumption is conservative relative to the NUREG-1150 study (NRC 1990), which assumed evacuation of 99.5 percent of the population within the emergency planning zone. The evacuation assumptions and analysis are deemed reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data were provided from SECPOP90 (NRC 1997c) by specifying the data for each of the 21 counties surrounding the plant, to a distance of 50 miles. In addition, generic economic data that are applied to the region as a whole were revised from the MACCS2 sample problem input when better information was available. The agricultural economic data were updated using available data from the 1997 Census of Agriculture (USDA 1998). These included per diem living expenses, relocation costs, value of farm and non-farm wealth, and fraction of farm wealth from improvements (e.g., buildings).

Exelon did not perform sensitivity analyses for the MACCS2 parameters, such as evacuation and population assumptions. However, sensitivity analyses performed as part of previous SAMA evaluations for other plants have shown that the total benefit of the candidate SAMAs would increase by less than a factor of 1.2 (typically about 20 percent) due to variations in these parameters. This change is small and would not alter the outcome of the SAMA analysis. Therefore, the staff concludes that the methodology used by Exelon to estimate the offsite consequences for Quad Cities provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDF and offsite doses reported by Exelon.

## **G.3 Potential Plant Improvements**

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by Exelon are discussed in this section.

### **G.3.1 Process for Identifying Potential Plant Improvements**

Exelon's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- review of plant-specific improvements identified in the Quad Cities IPE and IPEEE and subsequent PRA revisions,
- review of SAMA analyses submitted in support of original licensing and license renewal activities for other operating nuclear power plants, and
- review of other NRC and industry documentation discussing potential plant improvements, e.g., NUREG-1560.

Based on this process, an initial set of 280 candidate SAMAs was identified, as reported in Table F-1 in Appendix F to the ER. In Phase 1 of the evaluation, Exelon performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- the SAMA is not applicable at Quad Cities due to design differences,
- the SAMA is sufficiently similar to other SAMAs, and as such is combined with another SAMA,
- the SAMA has already been implemented at Quad Cities, and
- the SAMA has no significant safety benefit, or has implementation costs greater than any possible risk benefit.

Based on this screening, 226 SAMAs were eliminated leaving 54 for further evaluation. Of the 226 SAMAs eliminated, 63 were eliminated because they were not applicable to Quad Cities, 49 were similar and combined with other SAMAs, 82 were eliminated because they already had been implemented at Quad Cities, and 32 were eliminated because they either had no significant safety benefit or had implementation costs greater than any risk benefit. A preliminary cost estimate was prepared for each of the 54 remaining candidates to focus on those that had a possibility of having a net positive benefit. A screening cutoff of approximately

**\$110K, the maximum attainable benefit (MAB) if all severe accident risk could be eliminated, was then applied to the remaining candidates (see discussion in Section G.6.1 for a derivation of the MAB). Thirty-nine of the 54 SAMAs were eliminated because their estimated cost exceeded this MAB, leaving 15 candidate SAMAs for further evaluation in Phase 2. It is noted that only a set of 14 SAMAs were retained for further evaluation in the ER. One additional SAMA (Phase 1 SAMA 237) was marked for retention but was inadvertently not transferred to Phase 2. This error was identified and corrected during a response to an RAI (Exelon 2003b).**

**In response to an RAI concerning the impact of external events and uncertainties on the SAMA identification process, Exelon re-evaluated the Phase 1 SAMAs using a screening value of \$500K rather than \$110K. As a result, 83 Phase 1 SAMAs were identified for further consideration (rather than the 54 SAMAs originally identified). These SAMAs were subsequently reassessed using the same criteria as described in the ER. Table 7-2 of the response to the RAI contains the 83 SAMAs and their subsequent disposition. Seventeen of the 83 SAMAs were retained for further evaluation in Phase 2 as discussed in Section G.6.2 (the 15 SAMAs identified through the original screening plus two additional SAMAs) (Exelon 2003b).**

**The 17 remaining SAMAs were further evaluated and subsequently eliminated in the Phase 2 evaluation, as described in Sections G.4 and G.6.1 below.**

### **G.3.2 Review of Exelon's Process**

**Exelon's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events. The initial list of SAMAs generally addressed the accident categories that are dominant CDF and containment failure contributors or issues that tend to have a large impact on a number of accident sequences at Quad Cities.**

**The preliminary review of Exelon's SAMA identification process raised some concerns regarding the completeness of the set of SAMAs identified and the inclusion of plant-specific risk contributors. The staff requested clarification regarding the portion of risk represented by the dominant risk contributors (NRC 2003). Because a review of the importance ranking of basic events in the PRA could identify SAMAs that may not be apparent from a review of the top cut sets, the staff also questioned whether an importance analysis was used to confirm the adequacy of the SAMA identification process. In response to the RAI, Exelon provided a tabular listing of the contributors with the greatest potential for reducing risk as demonstrated by the risk reduction worth (RRW) assigned to the event (Exelon 2003b). Exelon used a cutoff of 1.02, and stated that events below this point would influence the CDF by less than two-percent. This equates to an averted cost-risk (benefit) of approximately \$2,000. Exelon also reviewed the LERF-based RRW events to determine if there were additional equipment failures or operator actions that should be included in the provided table. Similarly, Exelon correlated the**

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top RRW events with the SAMAs evaluated in the ER (Exelon 2003b). Based on these additional assessments, Exelon concluded that the set of 280 SAMAs evaluated in the ER addresses the major contributors to CDF and LERF, and that the review of the top risk contributors does not reveal any new SAMAs.

The staff questioned Exelon about lower cost alternatives to the SAMAs evaluated, including the use of a portable generator to power the battery chargers and backup nitrogen bottles or portable air compressors as backup to instrument air (NRC 2003). In response, Exelon provided estimated benefits and implementation costs for several lower cost alternatives, including those in the form of potential procedural changes (Phase 2 SAMAs 1, 2, 4, 6, 7, 8, 10, and 14) (Exelon 2003b). These are discussed further in Section G.6.2.

Exelon considered potential improvements to further reduce fire risk. These included an improvement to the response time of the sprinkler heads in the reactor feedwater pump areas which yielded a 25% reduction in the fire CDF. In addition, Exelon is planning to implement an improvement to the containment vent system by providing an alternate or redundant air supply for the containment vent valves which is expected to yield a 17% reduction in the fire CDF (see Phase 2 SAMA 17). Although Exelon did not evaluate specific fire modifications as part of the SAMA analysis, several of the SAMAs identified based on the internal events risk profile would also be effective in fire events, e.g., procedures for bypassing major ac buses, locally starting equipment, and controlling feedwater when 125-V DC is lost.

The staff notes that the set of SAMAs submitted is not all inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

The staff concludes that Exelon used a systematic and comprehensive process for identifying potential plant improvements for Quad Cities, and that the set of potential plant improvements identified by Exelon is reasonably comprehensive and therefore acceptable. This search included reviewing insights from the IPE and IPEEE and other plant-specific studies, reviewing plant improvements considered in previous SAMA analyses, and using the knowledge and experience of its PRA personnel. While explicit treatment of external events in the SAMA identification process was limited, it is recognized that the implementation of plant modifications for fire and seismic events and the absence of external event vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose.

## **G.4 Risk Reduction Potential of Plant Improvements**

Exelon evaluated the risk-reduction potential of the 17 Phase 2 SAMAs that were applicable to Quad Cities. A majority of the SAMA evaluations were performed in a bounding fashion in that the SAMA was assumed to completely eliminate the risk associated with the proposed enhancement. Such bounding calculations overestimate the benefit and are conservative.

Exelon used model re-quantification to determine the potential benefits. The CDF and population dose reductions were estimated using the 2002B Update of the Quad Cities PRA. The changes made to the model to quantify the impact of SAMAs are detailed in Section F.6 of Appendix F to the ER (Exelon 2003a) and in the response to the RAI (Exelon 2003b). Table G-3 lists the assumptions considered to estimate the risk reduction for each of the 17 Phase 2 SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk as used in the staff's assessment. The determination of the benefits for the various SAMAs is further discussed in Section G.6.1.

The staff has reviewed Exelon's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on Exelon's risk reduction estimates reported in the ER, but applied a multiplier of 10 to these values to account for benefits in external events as discussed in Section G.6.2.

**Table G-3. SAMA Cost/Benefit Screening Analysis**

Phase 2 SAMA	Assumptions	% Risk Reduction		Total Benefit (\$)		Cost (\$)
		CDF	Population Dose	Baseline <sup>1</sup>	Best Estimate <sup>2</sup>	
1 - Provide means for alternate safe shutdown makeup pump room cooling a - Revise procedures to use fire protection system as backup b - Develop procedures to open doors and use portable fans to extend safe shutdown makeup pump run time	Eliminate all failures associated with safe shutdown makeup pump room cooling	12	11	123,000	24,600	1a) 25,000 1b) 50,000
2 - Develop procedures to use Fire protection system as a containment spray source	Assign complete success to the drywell spray effectiveness in Level 2 for all sequences except Class II, IV, and V	0	15	107,000	36,800	50,000
3 - Extend direct current power availability in a station black-out (SBO) a - Use fuel cells to extend DC power availability in an SBO b - Use portable generators as battery charges during an SBO	Change the 4-hour offsite AC recovery time to 8 hours.	6	3	47,000		3a) >50,000 3b) 50,000
4 - Develop/enhance procedures to direct a 4 kV bus cross-tie. Investigate installation of hardware that would perform an automatic cross-tie to the opposite 4 kV bus given the failure of the dedicated diesel generator.	Reduce the operator action human error probability by a factor of 100	<1	<1	8,000		25,000
5 - Provide a redundant and diverse source of cooling for the diesel generators <sup>3</sup>	Eliminate all diesel generator cooling water failures	0	0	0		>50,000

Table G-3. SAMA Cost/Benefit Screening Analysis (contd)

Phase 2 SAMA	Assumptions	% Risk Reduction		Total Benefit (\$)		Cost (\$)
		CDF	Population Dose	Baseline <sup>1</sup>	Best Estimate <sup>2</sup>	
<b>6 - Allow for powering specific loads given an ac bus failure</b> <b>a - Provide procedures and hardware for bypassing major ac buses</b> <b>b - Provide procedures for locally starting equipment</b>	Eliminate all DC power failures as severe accidents	35	25	320,000	320,000	6a) >250,000 6b) 100,000
7 - Develop procedures to delete high drywell pressure signal from shutdown cooling isolation to allow initiation of shutdown cooling when the drywell is at elevated pressure	Set the basic event "shutdown cooling isolates on high drywell pressure" to zero	<1	<1	8,000		25,000
8 - Develop procedures to control feedwater flow without 125-V DC power to prevent tripping feedwater on high/low level	Reduce all DC power failures by 50%	18	13	167,000	167,000	75,000
9 - Remove the low pressure coolant injection loop select logic or install a bypass switch to allow use of the "A" loop for injection in the event of a "B" injection path failure <sup>2</sup>	Change the probability of failure to manually open the low pressure coolant injection A injection valve from 1.0 to 0.0	0	0	0		>50,000
10 - Develop procedures to stop reactor depressurization at 100 psig and demonstrate reactor core isolation cooling operability following depressurization	Eliminate all reactor core isolation cooling failures associated with suppression pool cooling	21	19	215,000	72,000 <sup>4</sup>	100,000
11 - Provide an alternate means of opening a pathway to the reactor pressure vessel for standby liquid control injection	Set the random and common cause failure of the explosive valves to zero	1	3	26,000		>100,000

Table G-3. SAMA Cost/Benefit Screening Analysis (contd)

Phase 2 SAMA	Assumptions	% Risk Reduction		Total Benefit (\$)		Cost (\$)
		CDF	Population Dose	Baseline <sup>1</sup>	Best Estimate <sup>2</sup>	
2 - Enrich boron to reduce the time required to achieve shutdown, thereby increasing time available for successful activation of standby liquid control	Reduce the human error probabilities for boron initiation and reactor pressure vessel water level control by 50%	<1	<1	7,000		>50,000
13 - Add a rupture disk to the hardened vent to provide passive overpressure relief	Set vent failure modes to zero	7	7	72,000		>100,000
14 - Develop or enhance existing procedures to control containment venting within a narrow band of pressure	Eliminate all Class II sequences with successful containment venting	23	21	236,000	78,000 <sup>4</sup>	100,000
15 - Provide hardware modification and procedural guidance to permit inter-unit cross-tie capability for turbine building closed cooling water	Set turbine building closed cooling water initiating event frequency and all turbine building closed cooling water component failures to 0.0	6	5	57,000		>50,000
16 - Bypass main steam isolation valve in turbine trip ATWS scenarios	Reduce human error probability for operator failure to bypass main steam isolation valve low reactor pressure vessel level interlock (or ATWS) from 0.91 to 0.01.	5	7	60,000		>100,000
17 - Improve instrument air reliability, thereby increasing ability to vent containment <sup>5</sup> a - Allow cross connection of uninterruptable compressed air supply to opposite unit b - Provide backup bottles or portable air compressors to open valves when instrument air is lost	Set vent failure modes to zero	7	7	72,000	28,000	17a) >50,000 17b) 50,000



### Table G-3. SAMA Cost/Benefit Screening Analysis (contd)

Note: SAMAs in bold were judged to be cost-beneficial.

- 1 Values are based on Exelon averted cost estimates reported in the ER, but are increased by a factor of 10 to account for additional risk reduction benefits in external events.
- 2 Values based on Exelon's more detailed re-evaluation of cost estimates, but are increased by a factor of 10 to account for additional risk reduction benefits in external events.
- 3 This SAMA was retained for further analysis because it did not meet any of the Phase 1 screening criteria discussed in Section G.3.1, but in the Phase 2 assessment was found to have no noticeable impact on CDF or population dose.
- 4 Revised benefit is based on a factor of three reduction from the baseline benefit. The staff expects that the actual benefit would be greater than this value, and above the estimated implementation cost.
- 5 This SAMA was retained for further analysis as a low cost alternative to major instrument air modifications (EC335806 and EC335807) that were approved for implementation but subsequently canceled due to the large scope of equipment changes. Although this SAMA has a negative net value, Exelon plans to implement this modification independent of the SAMA evaluation.

## G.5 Cost Impacts of Candidate Plant Improvements

Exelon estimated the costs of implementing the 17 candidate SAMAs through the application of engineering judgment and review of other plants' estimates for similar improvements. The cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include recurring maintenance and surveillance costs or contingency costs associated with unforeseen implementation obstacles. Cost estimates typically included procedures, engineering analysis, training, and documentation, in addition to any hardware.

The staff reviewed the bases for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates (presented in Table 7-3 of the response to the RAI) to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The cost estimates provided in the response to the RAI were typically in the form of ranges. The staff reviewed these ranges and found them to be consistent with estimates provided in support of other plants' analyses. In response to an RAI, Exelon provided more specific values, typically at the upper end of the previously provided ranges. For purposes of evaluating specific SAMAs, the staff selected values from the range to represent a reasonable or typical cost.

The staff concludes that the cost estimates provided by Exelon, as adapted by the staff (see Section G.6.2), are sufficient and appropriate for use in the SAMA evaluation.

## G.6 Cost-Benefit Comparison

Exelon's cost-benefit analysis and the staff's review are described in the following sections.

### G.6.1 Exelon Evaluation

The methodology used by Exelon was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997d). The guidance involves determining the net value for each SAMA according to the following formula:

$$\text{Net Value} = (\text{APE} + \text{AOC} + \text{AOE} + \text{AOSC}) - \text{COE}$$

where,

APE	=	present value of averted public exposure (\$)
AOC	=	present value of averted offsite property damage costs (\$)
AOE	=	present value of averted occupational exposure costs (\$)
AOSC	=	present value of averted onsite costs (\$)
COE	=	cost of enhancement (\$).

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. Exelon's derivation of each of the associated costs is summarized below.

#### Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

$$\begin{aligned} \text{APE} = & \text{Annual reduction in public exposure } (\Delta \text{person-rem/year}) \\ & \times \text{monetary equivalent of unit dose } (\$2,000 \text{ per person-rem}) \\ & \times \text{present value conversion factor } (10.76 \text{ based on a 20-year period with a} \\ & \text{7 percent discount rate}). \end{aligned}$$

As stated in NUREG/BR-0184 (NRC 1997d), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, Exelon calculated an APE of approximately \$36,000 for the 20-year license renewal period, which assumes elimination of all severe accidents.

#### Averted Offsite Property Damage Costs (AOC)

The AOCs were calculated using the following formula:

$$\begin{aligned} \text{AOC} = & \text{Annual CDF reduction} \\ & \times \text{offsite economic costs associated with a severe accident (on a per-event basis)} \\ & \times \text{present value conversion factor.} \end{aligned}$$

For the purposes of initial screening which assumes all severe accidents are eliminated, Exelon calculated an annual offsite economic risk of about \$2,800 based on the Level 3 risk analysis.

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This results in a discounted value of approximately \$30,200 for the 20-year license renewal period.

### Averted Occupational Exposure (AOE) Costs

The AOE costs were calculated using the following formula:

$$\begin{aligned} \text{AOE} = & \text{Annual CDF reduction} \\ & \times \text{occupational exposure per core damage event} \\ & \times \text{monetary equivalent of unit dose} \\ & \times \text{present value conversion factor.} \end{aligned}$$

Exelon derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997d). Best estimate values provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of \$2,000 per person-rem, a real discount rate of 7-percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents are eliminated, Exelon calculated an AOE of approximately \$800 for the 20-year license renewal period.

### Averted Onsite Costs (AOSC)

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. Exelon derived the values for AOSC based on information provided in Section 5.7.6 of the regulatory analysis handbook (NRC 1997d).

Exelon divided this cost element into two parts – the Onsite Cleanup and Decontamination Cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

$$\begin{aligned} \text{ACC} = & \text{Annual CDF reduction} \\ & \times \text{present value of cleanup costs per core damage event} \\ & \times \text{present value conversion factor.} \end{aligned}$$

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in the regulatory analysis handbook to be  $\$1.5 \times 10^9$  (undiscounted). This value was converted to

present costs over a 10-year cleanup period and integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents are eliminated, Exelon calculated an ACC of approximately \$26,000 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

$$\begin{aligned} \text{RPC} = & \text{Annual CDF reduction} \\ & \times \text{present value of replacement power for a single event} \\ & \times \text{factor to account for remaining service years for which replacement power is} \\ & \quad \text{required} \\ & \times \text{reactor power scaling factor} \end{aligned}$$

Exelon based its calculations on the value of 912 MW(e). Therefore, Exelon applied a power scaling factor of 912 MW(e)/910 MW(e) to determine the replacement power costs. For the purposes of initial screening, which assumes all severe accidents are eliminated, Exelon calculated an RPC of approximately \$17,300 for the 20-year license renewal period.

Using the above equations, Exelon estimated the total present dollar value equivalent associated with completely eliminating severe accidents at Quad Cities to be about \$110K.

#### Exelon's Results

If the implementation costs were greater than the MAB of \$110K, then the SAMA was screened from further consideration. Thirty-nine of the 54 SAMAs surviving the Initial Phase 1 screening were eliminated from further consideration in this way leaving 15 for final analysis. A more refined look at the costs and benefits was performed for the 15 SAMAs, and none were found to be cost-beneficial. The Phase 1 screening was revisited using a screening value of \$500K rather than \$110K to account for the potential impact of external events, and two additional SAMAs were identified.

Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA to account for the potential impact of external events and uncertainties. As a result, seven of the 17 SAMAs were found to be potentially cost-beneficial. Exelon performed a more detailed assessment of each of the seven SAMAs to more realistically estimate the risk reduction and implementation costs for each SAMA. Based on this assessment, Exelon concluded that none of the seven SAMAs would be cost-beneficial.

### G.6.2 Review of Exelon's Cost-Benefit Evaluation

The cost-benefit analysis performed by Exelon was based primarily on NUREG/BR-0184 (NRC 1997d) and was executed consistent with this guidance.

In response to an RAI, Exelon considered the uncertainties associated with the internal events CDF (see Table G-4 below). Since Exelon does not currently have an uncertainty analysis for the Quad Cities PRA, they estimated the uncertainty distribution by reviewing representative distributions for several plants (Exelon 2003b). Exelon used the results of the LaSalle Risk Methods Integration and Evaluation Program PRA to obtain the Quad Cities 95<sup>th</sup> percentile value. The ratio of the 95<sup>th</sup> percentile CDF to the mean CDF value in the LaSalle study is 4.5. The  $2.2 \times 10^{-6}$  per year point estimate mean CDF for Quad Cities was multiplied by this ratio, yielding a 95<sup>th</sup> percentile value of  $1.0 \times 10^{-5}$  per year for Quad Cities. This value and an error factor of eight are used to obtain the median value, and subsequently the 5<sup>th</sup> percentile value. If the 95<sup>th</sup> percentile value of the CDF were utilized in the cost-benefit analysis instead of the mean CDF value, the estimated benefits would increase by about a factor of five.

**Table G-4. Uncertainty in the calculated CDF for Quad Cities**

Percentile	CDF (per year)
95th	$1.0 \times 10^{-5}$
mean	$2.2 \times 10^{-6}$
median	$1.25 \times 10^{-6}$
5th	$1.6 \times 10^{-7}$

In the IPEEE, Exelon reported a fire CDF of  $7.13 \times 10^{-5}$  per year. This is approximately 30 times higher than the internal events CDF of  $2.2 \times 10^{-6}$  per year. Due to the large contribution from fire events, the staff asked Exelon to consider the impact on the SAMA identification and screening process by including the risk from external events. In response to the RAI, Exelon stated that the methodology used to determine the fire CDF is judged to be highly conservative, particularly in the areas of initiating event frequencies, fire response modeling and human reliability analysis. In Attachment A to its response, Exelon discusses the conservatism it believes exists in the model in each of these areas, and the approximate reduction that the conservatism affords. Exelon's rationale and the staff's assessment are summarized below.

For initiating events, Exelon refers to a recently issued NRC report concerning a revised fire events database (NRC 2002b). Exelon states that the NRC data would support the use of lower fire initiating event frequencies than used in the Quad Cities IPEEE. Based on a comparison of the initiating event frequencies from the report and from the Quad Cities model

for several fire areas, Exelon states that a factor of two reduction in the initiating event frequency portion of the fire CDF can be made as a reasonable assumption to provide a more accurate comparison to the internal events CDF. Exelon essentially argues that reductions in initiating event frequencies in these fire areas directly translate into similar reductions in specific equipment ignition frequencies. A staff review of the NRC report verified that the initiating frequencies were lower than those originally reported in the Quad Cities IPEEE, however, the data is only provided for fire areas and does not support the determination of ignition frequencies for specific equipment. In addition, less significant fires were screened from the data. Therefore, the data represent the fire ignition frequencies for more severe fires. These data are not directly comparable to the ignition frequencies in the IPEEE. Although the staff believes that reductions in the ignition frequencies have occurred, it does not believe that the evidence provided by the licensee is sufficient to justify a factor of two reduction. This is especially true for the risk-significant fires where ignition frequencies are typically low and the development of the ignition frequency is typically more rigorous.

For system fire response modeling, Exelon states that the Quad Cities fire model typically utilized bounding approaches regarding the immediate effects of the fire (e.g., all cables in a tray are always failed for a cable tray fire, and all failed cables lead to failure states of the associated equipment). Severity factors were utilized for the purposes of distinction (size and consequence of fire). The complement of the severity factor was also maintained in the analysis such that the total frequency was always preserved. In addition, Exelon repeats its discussion regarding lower initiating event frequencies. The staff finds that there are three points presented in support of this reduction factor: lower ignition frequencies, lower severity factors and bounding approaches regarding the fire's immediate effects. The staff's view on lower ignition frequencies is discussed above. For severity factors, a review of the NRC report did not find evidence that it supported a reduction in severity factor. The report states "Fire severity, risk implications, and duration of power operation fire events were not updated from the initial study." As a result the staff can not support this contribution to the system fire response modeling reduction. The final point is the claim that the bounding approaches were used regarding the fire's immediate effects. A review of the Quad Cities IPEEE Revision 1 submittal found that detailed fire modeling practices were used for risk-significant contributors. Given these observations, the staff believes that the proposed reduction factor is not supported.

For human reliability analysis and level of detail, Exelon provides examples of what it believes are simplified human reliability analysis modeling and lack of sufficient level of detail in the model, and concludes that such factors can easily lead to an additional factor of three reduction in the fire CDF. The IPEEE Revision 1 submittal states that the fire PRA model incorporated all of the operator actions included in the plant's internal events PRA. Actions in the main control room were not considered adversely impacted by postulated fire events outside the control room. For fires in the control room, actions with a required response time of 30 minutes or less were considered failed. All actions outside the control room were set to 1.0 except for two.

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These two actions were considered as applicable and not modified from their internal-events values. The IPEEE submittal also states, "The extensive use of a human error probability of 1.0 for potential operator actions outside the control room is conservative but does not have a significant impact on the overall analysis results. This is because these events do not appear in the dominant cutsets for the analysis." Although the staff believes that the consideration of additional actions would likely reduce the calculated risk, we do not believe that the factor of three reduction due to human reliability analysis and level of detail is fully supported.

In addition to the above discussion, Exelon noted that a large oil fire involving the reactor feedwater pumps was the dominant risk contributor from the IPEEE fire study. In response to this insight, a modification was performed at Quad Cities to improve the response time of the sprinkler heads in the reactor feed pump area, and the modification results in a 25% reduction in fire risk. Exelon also noted that the installation of a modification to provide alternate or redundant air supply for the containment vent valves (addressed by Phase 2 SAMA 17) in the Fall 2003 has been estimated to reduce the fire CDF by 17 percent. However, Exelon notes that the combined benefit of this modification with the sprinkler head modification would likely be less than the sum of the benefits from each of these modifications.

As a result of the improvements in ignition frequency, fire response modeling, and human reliability analysis, Exelon states that it believes the fire CDF can be reduced by a factor of 12 from  $7.13 \times 10^{-5}$  per year to  $6.1 \times 10^{-6}$  per year. As such, the fire CDF would be about three times the internal events CDF. Based on this assessment, Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA, and characterized the result as an upper bound averted cost estimate. These values could be considered to account for SAMA benefits in internal events, external events, and internal floods. These values would also represent the impact of uncertainties in internal event frequencies (i.e., the impact if the CDF was increased from the mean value of  $2.2 \times 10^{-6}$  per year to the 95<sup>th</sup> percentile value of  $1.0 \times 10^{-5}$  per year).

The staff agrees that the Quad Cities IPEEE fire analysis contains numerous conservatisms and that a more realistic assessment could result in a substantially lower fire CDF. In the staff's view, the factor of 12 reduction in CDF claimed by Exelon represents the maximum reduction that could be justified. At this level, the fire CDF would be three times the internal events CDF, and the benefits of SAMAs in external events would be accommodated by applying a multiplier of five to the internal events benefits. However, the staff believes that the information provided by Exelon is not sufficient to support the full reduction and that the reduction in fire CDF may be much smaller than claimed by Exelon, closer to a factor of two to three. Given a factor of three reduction in the IPEEE fire CDF, the resulting fire CDF would be about a decade higher than the internal events CDF. This would justify use of a multiplier of 10 rather than five to represent the additional SAMA benefits in external events. Consideration of uncertainties could result in further increases in this multiplier.



In view of the large relative contribution to risk from fire events at Quad Cities, the staff increased the averted cost estimates reported in the ER (which are based on consideration of only internal events) by a factor of 10 to obtain a baseline estimate of the benefits for each SAMA. This implicitly assumes that each SAMA would offer the same percentage reduction in external event CDF and population dose as it offers in internal event CDF and population dose. While this provides only a crude approximation of the potential benefits, such an adjustment was considered appropriate given the large risk contribution from external events relative to internal events and the lack of information from the licensee on which to base a more precise risk reduction estimate for external events. The baseline benefit values are shown in Table G-3 for the 17 Phase 2 SAMAs. To account for a potentially greater contribution from external events and the impact of uncertainties, the staff also considered the impact that further increases in the multiplier would have on the identification and dispositioning of candidate SAMAs, as described below.

As shown in Table G-3, the baseline benefits exceed the estimated implementation costs for seven of the Phase 2 SAMAs (1, 2, 6, 8, 10, 14, and 17). Exelon re-examined each of these SAMAs to ensure that the averted cost estimates from the internal events analysis appropriately represent the potential benefit rather than the maximum benefit. This included re-examining the assumptions used in the initial screening analysis, as well as recognizing existing model limitations that could lead to over-estimation of the averted costs. In some cases, the implementation costs were also refined to better represent the actual costs that would be incurred. The results of this reassessment are provided in Table 7-4 of the RAI response (Exelon 2003b), and summarized below. The staff considered this additional information and where appropriate, developed revised estimates of the benefits for these SAMAs. These are reported as "best estimate" values in Table G-3.

- SAMA 1 involves improving the existing procedural guidance for use of the fire protection system as a backup for providing safe shutdown makeup pump room cooling. The staff initially estimated the benefit of this SAMA to be \$123,000 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of 10 adjustment to account for external events. Based on additional information provided by Exelon, the benefit would be about a factor of five lower, or about \$24,600 per unit, if a more realistic human error probability was used for the operator action to utilize the fire protection system as a backup means of safe shutdown makeup pump room cooling. Exelon states that the current failure probability for this action is 0.11, which is based on a lack of clear symptom-based direction for subsequent losses of service water following initial use of the safe shutdown makeup pump. However, all the dominant cutsets that include this human error probability result from the loss of service water as an initiating event. The licensee states that the current procedural direction for using the Fire protection system to recover when service water is lost as an initiating event is very clear and states that a more realistic human error probability for these

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scenarios is a factor of five lower. The staff finds this rationale to be reasonable and concludes that the benefit of this SAMA would more realistically be about \$24,600. Exelon estimated the cost of implementing this SAMA to be about \$25,000 to \$50,000 per unit, including the cost of engineering analysis and procedure development. The staff expects the costs to be towards the low end of this range because this appears to be an enhancement to current procedures as opposed to the development of new procedures, and does not appear to require additional engineering analysis. As an alternative, Exelon also considered developing procedural guidance to open safe shutdown makeup pump room doors and use portable fans to extend safe shutdown makeup pump run time. A thermal analysis would be needed to demonstrate the viability of this strategy. The costs and benefits associated with this alternative would be higher than those for the fire system procedure modification due to the required thermal analysis. The staff concludes that this SAMA would have a slightly negative net value. However, the costs and benefits are comparable, and the SAMA could be cost-beneficial given a more detailed assessment of its benefits in external events, or when uncertainties are taken into account.

- SAMA 2 involves enhancing the drywell spray system by developing procedural guidance to use the fire protection system as an alternative source of water. The staff initially estimated the benefit of this SAMA to be \$107,000 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of 10 adjustment to account for external events. Exelon states that two classes of scenarios account for much of the calculated averted cost and that these scenarios would not benefit from SAMA 2. In one scenario class, Exelon states that power would not be available to the drywell spray valves precluding any benefit from the proposed improvement. The other scenario class does not credit the recovery of the low pressure coolant injection pumps for the drywell spray function even though these pumps are available. The staff finds this rationale to be reasonable. When credit for the SAMA is eliminated for these two scenarios, the total benefit is reduced to \$36,800 per unit. Exelon estimated the cost of implementing this SAMA to be about \$25,000 to \$50,000 per unit, including the cost of engineering analysis, procedure development, and training. The staff expects the costs to be at the upper end of this range because of the need for engineering analysis to support procedure development. The staff concludes that this SAMA has a negative net value. However, the costs and benefits are generally comparable, and the SAMA could be cost-beneficial given a more detailed assessment of its benefits in external events, or when uncertainties are taken into account.
- SAMA 6 involves two options for improving the plant's response to the loss of 125-V DC power. These are: (a) the installation of hardware and development of procedures for bypassing major DC buses, and (b) the development of procedures for locally starting equipment using temporary cables to feed DC from switchgear from the other unit. Based on Exelon's risk reduction estimate reported in the ER and a factor of 10 adjustment to account for external events, the staff estimates that SAMA 6 has a benefit of approximately

\$320,000 per unit. Exelon states that alternative feeds are already proceduralized for those buses that can be fed from either unit, and that bypassing the other DC buses would require additional hardware, including buses, distribution cabinets, and breakers. Exelon estimates that the costs associated with option 6a (hardware, engineering analysis, procedure development, and training) would exceed \$250,000 per unit. The staff finds this position to be reasonable given the extent of the associated hardware modifications. For the second alternative, Exelon states that locally starting equipment without DC power is not a trivial action due to personnel hazard that results when the DC powered protection and interlocks are also not available. Exelon concludes that preparing procedural direction to bypass major DC buses, providing instructions for local start, and providing training for the recommended approaches would lead to overall implementation costs that would easily exceed \$200,000 per unit. The staff believes that the cost estimate may be overstated, and may more reasonably be estimated at \$100,000 per unit. The staff notes that Exelon identified several modifications for potential fire CDF reduction in response to RAIs, including the installation of relays and fuses to improve 125-V DC control power availability for 4-kV and 480-V switchgear, respectively (see Section G.2.2). However, the licensee stated that these were not pursued due to the extensive design engineering and analysis (Exelon 2003b). The staff believes that locally starting equipment could be effective in recovering some of these fire-related events. The staff believes that the licensee review of the protection and interlock requirements for the 4-kV and 480-V AC breakers would benefit from the design similarities within each class of breakers and that standard sets of precautions and processes could be developed. It is further believed that considerable savings in engineering analysis would be achieved due to the similarities between the units. As such, the costs of SAMA 6b are expected to be lower than estimated by Exelon. The staff concludes that when these lower costs are taken into consideration, SAMA 6b would be cost-beneficial.

- SAMA 8 increases the functionality of feedwater during loss of 125-V DC scenarios through the development of procedures to control feedwater without 125-V DC. Based on Exelon's risk reduction estimate reported in the ER and a factor of 10 adjustment to account for external events, the staff estimates that SAMA 8 has a benefit of approximately \$167,000 per unit. Exelon originally estimated that the cost of implementing this SAMA would be about \$50,000 to \$100,000 per unit, including the cost of engineering analysis, procedure development, and training. In its revised assessment, Exelon indicates that the cost would be \$100,000 per unit. Exelon states that the difficulty of controlling feedwater without DC power is not with the feedwater control system but with the leakage past the closed feedwater regulation valves. Exelon explained that the operators would need to trip two of the three reactor feed pumps (RFPs) to reduce flow and would attempt to control reactor vessel level on the remaining pump. However, the loss of 125-V DC results in the loss of control power and protective functions to the RFPs. In addition, due to the leakage past the closed feedwater control valves, the remaining RFP would need to be cycled on and off to

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maintain level. Without DC power, the tripping of the two RFPs and the cycling of the remaining RFP have to be performed locally at the breaker. It is further stated that these compensating actions are difficult such that procedures would require significant development work and engineering analysis. The NRC staff believes that procedural direction and training addressing the precautions and actions for timely local tripping of two RFPs and the local operation of the remaining pump would be an effective means of improving the likelihood of success of these difficult compensatory actions. The NRC staff also believes that developing guidance for these actions prior to the event will be far more effective than attempting to mitigate a loss of 125-V DC without such guidance. The staff expects the costs to be within the range originally provided by Exelon, but less than the upper end of this range because the implementation issues appear to be well understood and the engineering analysis does not appear to be extensive. The staff concludes that SAMA 8 would be cost-beneficial.

- **SAMA 10 involves the development of operating procedures to terminate reactor depressurization prior to loss of the steam-driven reactor core isolation cooling pump (e.g., 100 psig), and supporting analyses to establish that reactor core isolation cooling can run reliably following depressurization. The staff initially estimated the benefit of this SAMA to be \$215,000 per unit based on Exelon's risk reduction estimate reported in the ER and a factor of 10 adjustment to account for external events. In response to an RAI, Exelon argued that the risk reduction would be about a factor of three less if operator recovery of reactor pressure vessel injection following venting (which is not credited in the PRA) were taken into account. Exelon states that current procedures allow considerable flexibility in implementing containment venting and providing long term injection. Numerous alternate injection systems are identified in the current emergency operating procedures and there is significant time available for the Emergency Response Organization to develop a strategy to utilize this equipment following venting. Exelon identified several specific alternatives for providing long-term injection and the associated procedures, including using low pressure coolant injection pumps with an inventory source from the condensate storage tank, using condensate pumps with inventory provided by the hotwell with makeup to the hotwell provided by standby coolant supply and using the fire protection system pumps through the residual heat removal system. Exelon concludes that given these considerations, its original benefit estimate is high by at least a factor of three. SAMA 14 addresses a similar improvement associated with providing procedural enhancements for the control of containment venting in order to avoid the adverse impacts on low pressure emergency core cooling injection systems. The estimated benefits for SAMA 14 are similar to those for SAMA 10, and Exelon also argued that the benefits ascribed to SAMA 14 are high by a factor of three for the same reasons as stated for SAMA 10.**

Exelon's justification for the factor of three reduction is a judgement that if the numerous alternatives available for injection were credited in the PRA the associated CDF would be

reduced by a factor of three or more. The staff believes that some risk improvement would be achieved if these strategies were credited in the PRA, but based on the quantitative rationale provided by Exelon was not able to reach a conclusion that a factor of three reduction was appropriate. Exelon originally estimated that the cost of implementing SAMA 10 or 14 would be about \$50,000 to \$100,000 per unit, including the cost of engineering analysis, procedure development, and training, which could be extensive. In its revised assessment Exelon indicates that the cost would be \$100,000 per unit. The staff considers this estimate to be reasonable. The staff notes that without additional credit for operator action, SAMA 10 or 14 would be cost-beneficial, whereas with the full reduction in benefits claimed by Exelon (i.e., a benefit of \$72,000 rather than \$215,000 for SAMA 10) both of these SAMAs would have a negative net value. The staff expects that the actual benefit would be higher than claimed by Exelon, and close to or greater than the estimated implementation costs for these SAMAs. Accordingly, the staff concludes that SAMAs 10 and 14 are cost-beneficial.

It should be noted that since both SAMAs 10 and 14 address a similar safety function, the implementation of either SAMA might reduce the risk reduction potential to a level at which the remaining SAMA would not be cost-beneficial.

- SAMA 17 involves the use of a cross connection of uninterruptable compressed air supply to the opposite unit. The lower cost alternative to this SAMA is the use of backup bottles or portable air compressors. Based on Exelon's risk reduction estimate reported in the ER and a factor of 10 adjustment to account for external events, the staff originally estimated the benefit associated with this SAMA to be about \$72,000. This estimate was based on assuming a perfect vent. Exelon provided a revised benefit estimate based on a refinement of the modeling approach used to estimate the benefit. Specifically, the revised estimate assumes that the instrument air recovery is perfect. The staff considers this assumption to be more representative of the benefits offered by this SAMA. Based on the revised estimate, the staff estimates the benefit for this SAMA to be \$28,000 per unit. Although the estimated implementation costs (\$50,000) are higher than the estimated benefit, Exelon plans to implement this modification.

Based on the staff's review of the information provided by Exelon in response to the RAI, the staff has determined that six SAMAs are potentially cost-beneficial (Phase 2 SAMAs 1, 2, 6, 8, 10, and 14).

The staff also considered the impact that further increases in the contribution from external events or analysis uncertainties would have on the dispositioning of the 10 Phase 2 SAMAs that were screened out (i.e., the unshaded SAMAs in Table G-3). When Exelon's averted cost estimates reported in the ER are increased by a factor of 10, SAMA 3 comes close to being cost-beneficial, with an estimated benefit of \$47,000 and an estimated implementation cost of

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\$50,000 per unit. The low cost alternative explored in SAMA 3 involves the use of portable diesel generators to provide backup power to the battery chargers. Based on staff estimates produced as part of the resolution of Generic Safety Issue 189, "Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident," (NRC 2002c) the cost for use of a portable generator as backup power was estimated at about \$200,000 per unit. Even if the implementation costs are somewhat lower, it is unlikely that SAMA 3 will be cost-beneficial at Quad Cities.

Several other SAMAs have estimated benefits within a factor of two of the estimated implementation costs, i.e., Phase 2 SAMAs 13, 15, and 16. The benefits for these SAMAs are estimated to range from \$57,000 to \$72,000 and the implementation costs are estimated to be greater than \$100,000. However, each of these SAMAs involve hardware modifications as well as procedure changes. The cost range for hardware modifications provided by Exelon is greater than \$100,000, up to \$1 million or more. Although Exelon did not provide details on the hardware modifications needed for these SAMAs, the staff believes that such modifications would be significantly greater than the minimal hardware cost provided by Exelon. Therefore, the staff does not believe that these SAMAs would be cost-beneficial at Quad Cities.

Exelon also performed a sensitivity analysis that addressed variations in discount rate. The use of a three-percent real discount rate (rather than seven percent used in the baseline) results in an increase in the maximum attainable benefit of approximately 28 percent. The results of the sensitivity study are bounded by the baseline averted cost estimates adopted by the staff for each SAMA.

The staff concludes that the costs of all of the SAMAs assessed would be higher than the associated benefits, with the exception of the six SAMAs discussed above.

## G.7 Conclusions

Exelon compiled a list of 280 SAMA candidates using the SAMA analyses as submitted in support of licensing activities for other nuclear power plants, NRC and industry documents discussing potential plant improvements, and the plant-specific insights from the Quad Cities IPE, IPEEE, and current PRA model. A qualitative screening removed SAMA candidates that (1) were not applicable at Quad Cities due to design differences, (2) were sufficiently similar to other SAMAs, and therefore combined with another SAMA, (3) had already been implemented at Quad Cities, or (4) had no significant safety benefit or had implementation costs greater than any possible risk benefit. A total of 226 SAMA candidates were eliminated based on the above criteria, leaving 54 SAMA candidates for further evaluation.

Using guidance in NUREG/BR-0184 (NRC 1997d), the current PRA model, and a Level 3 analysis developed specifically for SAMA evaluation, a MAB of about \$110K, representing the

total present dollar value equivalent associated with completely eliminating severe accidents at Quad Cities, was derived. Thirty-nine of the 54 SAMAs were screened from further evaluation because their implementation costs were greater than this MAB. Exelon performed a revised screening based on consideration of the potential impact of external events and uncertainties, and two additional SAMAs were identified. For the 15 SAMA candidates and two additional alternatives identified during the re-screening, a more detailed assessment and cost estimate were developed as shown in Table G-3. Exelon applied a multiplier of five to the averted cost estimates (for internal events) for each SAMA, and characterized the result as an upper bound averted cost estimate. The baseline benefits exceeded the estimated implementation costs for seven of the Phase 2 SAMAs. Exelon re-examined each of these SAMAs to ensure that the averted cost estimates from the internal events analysis appropriately represent the potential benefit rather than the maximum benefit. As a result of this reassessment, the cost-benefit analyses showed that none of the candidate SAMAs were cost-beneficial.

The staff reviewed the Exelon analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs, the generally large negative net benefits, and the inherently small baseline risks support the general conclusion that the SAMA evaluations performed by Exelon are reasonable and sufficient for the license renewal submittal. The unavailability of a seismic and fire PRA model precluded a detailed quantitative evaluation of SAMAs specifically aimed at reducing risk of these initiators; however, to account for external events, the staff increased the estimated internal events benefits by factor of ten. Based on this evaluation, seven SAMAs would have a positive net value. When more realistic assumptions are used, this list is reduced to four SAMAs that would be cost-beneficial (SAMAs 6, 8, 10, and 14), and two additional SAMAs that are close to being cost-beneficial and could be cost-beneficial given a more detailed assessment of their benefits in external events, or when uncertainties are taken into account (SAMAs 1 and 2). The staff believes that these SAMAs could be effective in recovering some of the fire-related events. Since SAMA 10 and 14 address a similar safety function, implementation of either SAMA might reduce the residual risk to a level at which the remaining SAMA would not likely be cost-beneficial. Improvements realized as a result of the IPEEE process at Quad Cities, and implementation of these cost-beneficial SAMAs would minimize the likelihood of identifying further cost-beneficial enhancements. It is also noted that, although the SAMA is not cost-beneficial, Exelon plans to implement SAMA 17 independent of this SAMA evaluation.

Based on its review of the Exelon SAMA analysis, the staff concurs that none of the candidate SAMAs are cost-beneficial, except as noted above. This is based on conservative treatment of costs and benefits. This conclusion is consistent with the low residual level of risk indicated in the Quad Cities PRA and the fact that Quad Cities has already implemented many plant improvements identified from the IPE and IPEEE processes. Given the potential risk reduction and the relatively modest implementation costs of the six SAMAs identified above, the staff

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concludes that further evaluation of these SAMAs by Exelon is warranted. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

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**BIBLIOGRAPHIC DATA SHEET**

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11. ABSTRACT *(200 words or less)*

This final supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted to the Nuclear Regulatory Commission (NRC) on January 1, 2003, by Exelon Generation Company, LLC (Exelon), to renew the operating licenses for Quad Cities Nuclear Power Station, Units 1 and 2, for an additional 20 years under 10 CFR Part 54. This final SEIS includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental effects of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The NRC staff's recommendation is that the Commission determine that the adverse environmental impacts of license renewal for Quad Cities Nuclear Power Station are not so great that preserving the option of license renewal for energy-planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437); (2) the Environmental Report submitted by Exelon; (3) consultation with other Federal, State, and Local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

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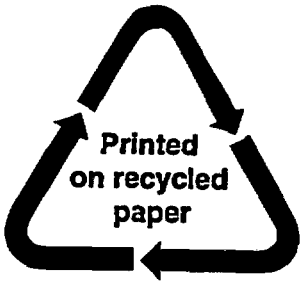
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