

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 1

**Regarding the
Calvert Cliffs Nuclear Power Plant**

Final Report

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



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NUREG-1437

Supp. 1

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Manuscript Completed: October 1999

Date Published: October 1999

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



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Abstract

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental effects of renewing nuclear power plant operating licenses for a 20-year period in the *Generic Environmental Impact Statement for Renewal of Nuclear Plants* (GEIS), NUREG-1437, and codified the results in 10 CFR Part 51. The GEIS (and its Addendum 1) identifies 93 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 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 Baltimore Gas and Electric Company (BGE) to renew the operating licenses for Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 1 and Unit 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 effects of the proposed action, the environmental impacts 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.

Neither BGE or the staff have identified significant new information for any of the 69 issues for which the GEIS reached generic conclusions and which apply to the CCNPP. Therefore, the staff concludes that the impacts of renewing the CCNPP operating licenses will not be greater than impacts identified in the GEIS for these issues. For each of these issues, the GEIS conclusion is that the impact is of small significance (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and from spent fuel which were not assigned a single significance level) and that additional mitigation measures are likely not to be sufficiently beneficial to be warranted.

Each of the remaining 24 issues that apply to the CCNPP is addressed in this SEIS. For each applicable issue, the staff concludes that the significance of the potential environmental effects of renewal of the operating license is small. The staff also concludes that additional mitigation measures are recommended only for threatened or endangered species and that mitigation measures beyond those recommended by the U.S. Fish and Wildlife Service are not warranted.

The NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for Calvert Cliffs Nuclear Power Plant Unit 1 and Unit 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 BGE; (3) consultation with Federal, State, and local agencies; (4) its own independent review, and (5) its consideration of public comments.

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Executive Summary

By letter dated April 8, 1998, Baltimore Gas and Electric Company (BGE) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating licenses for Units 1 and 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) for an additional 20-year period. If the operating licenses are renewed, Federal (other than NRC) agencies, State regulatory agencies, and the owners of the plant will ultimately decide whether the plant will continue to operate. This decision will be 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 not renewed, Units 1 and 2 will be shut down at or before the expiration of the current operating licenses, which are July 31, 2014, and August 13, 2016, respectively.

Under the National Environmental Policy Act (NEPA), an environmental impact statement (EIS) is required for major Federal actions significantly affecting the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor operating license; 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437.^(a)

Upon acceptance of the BGE 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. The staff visited the CCNPP site in July 1998 and held public scoping meetings on July 9, 1998, in Solomons, Maryland. The staff reviewed the BGE environmental report (ER) and compared it to the GEIS, consulted with Federal, State, and local agencies, conducted an independent review of the issues following the guidance set forth in the draft *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, NUREG-1555, Supplement 1, and considered the public comments from the scoping process and the comment period for the draft Supplemental Environmental Impact Statement (SEIS) for CCNPP.

This supplemental EIS (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 alternatives available for reducing or avoiding adverse effects. It also includes the staff's recommendation regarding the proposed action.

The Commission has adopted the following definition 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 NRC) decisionmakers.

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

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- | The Commission has provided the criterion to be used in evaluating the environmental impacts, as follows [10 CFR 51.95(c)(4)]:

... 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 CCNPP continues to operate beyond the period of the current operating licenses.

- | The GEIS contains the results of a systematic evaluation of the consequences of renewing an operating license and operating a nuclear power plant for an additional 20 years. It evaluates 93 environmental issues using a three-level standard of significance—small, moderate, or large—based on Council on Environmental Quality guidelines. These significance levels are

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 93 issues considered in the GEIS, the analysis in the GEIS shows:

- (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 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 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 significant new information, the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated Category 1 in 10 CFR Part 51, Subpart A, Appendix B.

- | Of the 24 issues not meeting the criteria set forth above, 22 were 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, or at the time this document was prepared.

This SEIS evaluates all 93 environmental issues considered in the GEIS and one new issue—microorganisms in high-radiation, high-temperature conditions, which was raised during the scoping process. The SEIS considers the environmental impacts associated with alternatives to license renewal and compares the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that are considered include the no-action alternative (not renewing the CCNPP operating licenses) and alternative methods of power generation. Among the alternative methods of power generation, coal-fired and gas-fired generation appear the most likely if the power from CCNPP is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the CCNPP site or an unspecified "greenfield" site.

BGE 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 BGE nor the staff is aware of any significant new information related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, neither BGE or the staff has identified any new issue applicable to the CCNPP that has a significant environmental impact. Therefore, the staff relies upon the conclusions of the GEIS for all 69 Category 1 issues.

The staff has reviewed the BGE analysis for each Category 2 issue and has conducted an independent review of each issue. Five Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at CCNPP. Four additional Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. BGE has stated in its ER that it "has not identified the need to undertake the major refurbishment activities that the GEIS assumed for license renewal, and no other modifications have been identified that would directly affect the environment or plant effluents."

The remaining 13 Category 2 issues, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this SEIS. For all issues, the staff concludes that the potential environmental effects are of SMALL significance in the context of the GEIS. For Severe Accident Mitigation Alternatives (SAMAs), the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Although a limited number of cost-beneficial SAMAs (four) were identified, the 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.

In addition to considering the 93 issues listed in the GEIS, the staff considered the potential issue associated with microorganisms that live in high-radiation, high-temperature environments and concludes that this issue, while new, is not significant.

Mitigation measures were considered for each Category 2 issue. In general, current measures to mitigate environmental impacts of plant operation were found to be adequate, and no additional

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mitigation measures were deemed sufficiently beneficial to be warranted. However, the U.S. Fish and Wildlife Service recommended that BGE amend its conservation agreement with The Nature Conservancy relative to tiger beetles and set constraints on activities in the vicinity of bald eagle nests. No other mitigation measures related to threatened or endangered species are warranted.

In the event that the CCNPP operating licenses are not renewed, and the plants cease operation at or before the expiration of their current operating licenses, the adverse impacts of likely alternatives will not be smaller than those associated with continued operation of CCNPP. The impacts may, in fact, be greater in some areas.

The NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for Calvert Cliffs Nuclear Power Plant Unit 1 and Unit 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 BGE; (3) consultation with other Federal, State and local agencies; (4) its own independent review; and (5) its consideration of public comments.

Abbreviations/Acronyms

AC	alternating current	
ACC	averted cleanup costs	
AEA	Atomic Energy Agency	
AFAS	auxiliary feedwater actuation signal	
AFS	American Fisheries Society	
AFW	auxiliary feedwater	
ALARA	as low as reasonably achievable	
ANSP	Academy of Natural Sciences of Philadelphia	
AOC	averted offsite property damage costs	
AOE	averted occupational exposure	
AOSC	averted onsite costs	
APE	averted public exposure	
ATS	automatic transfer switch	
BGE	Baltimore Gas and Electric Company	
BTU	British thermal units	
CAA	Clean Air Act	
CCNPP	Calvert Cliffs Nuclear Power Plant	
CCPRA	Calvert Cliffs Probabilistic Risk Assessment	
CDF	core damage frequency	
CEQ	Council on Environmental Quality	
CFR	Code of Federal Regulations	
CO	carbon monoxide	
COE	cost of enhancement	
COMAR	Code of Maryland Regulations	
CST	condensate storage tank	
CVCS	Chemical and Volume Control System	
CWA	Clean Water Act	
CZMA	Coastal Zone Management Act	
DAW	dry active waste	
DBA	design-basis accidents	
DC	direct current	
DO	dissolved oxygen	
DOC	U.S. Department of Commerce	
DOE	U.S. Department of Energy	
DW	demineralized water	
ECCS	Emergency Core Cooling System	
EDG	emergency diesel generator	
EIA	Energy Information Administration	
EIS	Environmental Impact Statement	

Abbreviations/Acronyms

	ELF-EMF	extremely low frequency-electromagnetic field
	EPA	U.S. Environmental Protection Agency
	ER	environmental report
	ESRP	Environmental Standard Review Plan
	FERC	Federal Energy Regulatory Commission
	FES	Final Environmental Statement
	FONSI	finding of no significant impact
	FR	Federal Register
	FSAR	Final Safety Analysis Report
	FWPCA	Federal Water Pollution Control Act
	FWS	U.S. Fish and Wildlife Service
	GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437
	gpd	gallons per day
	gpm	gallons per minute
	GRTS	Gaseous Radwaste Treatment System
	Gy	gray (unit of radiation dose that is equivalent to 100 rad)
	ha	hectare
	HABS	Historic American Building Survey
	HEPA	high-efficiency particulate air (filter)
	HPSI	high-pressure safety injection
	IPA	Integrated Plant Assessment
	IPE	Individual Plant Examination
	IPEEE	Individual Plant Examination for External Events
	IRP	Integrated Resources Plan
	J	joule
	J/kg	joule/kilogram
	kG	kilogray
	km	kilometer
	kV	kilovolt
	kWh	kilowatt-hour
	kWh/m ²	kilowatt-hours per square meter
	L/d	liters per day
	L/s	liters per second
	LOCA	loss of coolant accident
	LOS	level of service
	LRTS	Liquid Radwaste Treatment System
	LWR	light water reactor

m	meter	
mA	milliampere	
MACCS	MELCOR Accident Consequence Code System	
MDE	Maryland Department of the Environment	
MDNR	Maryland Department of Natural Resources	
MEA	Maryland Energy Administration	
mGy	milligray	
mi	mile	
MPF	Materials Processing Facility	
MSL	mean sea level	
mSv	millisievert	
MT	metric tonne	
MTHM	metric tonnes of heavy metal	
MW	megawatt	
MWd/MTU	megawatt-days per metric tonne of uranium	
MWe	megawatts-electric	
MWPS	Miscellaneous Waste Processing System	
NAS	National Academy of Sciences	
NEPA	National Environmental Policy Act	
NESC	National Electric Safety Code	
NIEHS	National Institute of Environmental Health Sciences	
NMFS	National Marine Fisheries Service	
NO _x	nitrogen oxides	
NPDES	National Pollutant Discharge Elimination System	
NRC	U.S. Nuclear Regulatory Commission	
NRR	Office of Nuclear Reactor Regulation	
ODCM	Offsite Dose Calculation Manual	
OL	operating license	
PEPCO	Potomac Electric Power Company	
PJM	Pennsylvania-New Jersey-Maryland	
PM ₁₀	particulate matter having a diameter of 10 microns or less	
PORV	power operated relief valve	
PRA	Probabilistic Risk Assessment	
PSC	Public Service Commission	
PX	Pool Spot Energy Market	
RACT	reasonably available control technology	
RAI	request for additional information	
RCDT	reactor coolant drain tank	
RCP	reactor coolant pump	
RCRA	Resource Conservation and Recovery Act	
RCW	reactor coolant wastes	

Abbreviations/Acronyms

RCWPS	Reactor Coolant Waste Processing System
REMP	radiological environmental monitoring program
RIS	representative important species
s	second
SAMA	Severe Accident Mitigation Alternative
SAMDA	Severe Accident Mitigation Design Alternative
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Office
SMITTR	Surveillance, online monitoring, inspections, testing, trending, and recordkeeping
SO ₂	sulfur dioxide
SO _x	sulfur oxides
SRM	Staff Requirements Memorandum
SRW	service water system
SSSA	spurious safety system actuation
Sv	sievert (unit of radiation measurement, equivalent to 100 rem)
SW	saltwater system
SWPS	Solid Waste Processing System
TDR	Transferable Development Right
UFSAR	Updated Final Safety Analysis Report
U _{RP}	long-term replacement power costs
USC	United States Code
USQ	unreviewed safety question
V	volt
VOCs	volatile organic compounds
WGPS	Waste Gas Processing System

1.0 Introduction

Baltimore Gas and Electric Company (BGE) operates Calvert Cliffs Nuclear Power Plant (CCNPP) Units 1 and 2 in southern Maryland on the west shore of the Chesapeake Bay under operating licenses (OLs) DPR-53 and DPR-69 issued by the U.S. Nuclear Regulatory Commission (NRC). These OLs will expire in 2014 for Unit 1 and 2016 for Unit 2. By letter dated April 8, 1998, BGE submitted an application to the NRC to renew the CCNPP OLs for an additional 20 years under Title 10 of the Code of Federal Regulations (CFR) Part 54. BGE is a *licensee* for the purposes of its current OLs and an *applicant* for the renewal of the OLs.

The National Environmental Policy Act of 1969 (NEPA) requires an environmental impact statement (EIS) for major Federal actions significantly affecting the quality of the human environment. As provided in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996, 1999a),^(a) under NRC's environmental protection regulations in 10 CFR Part 51 implementing NEPA, renewal of a nuclear power plant operating license is identified as a major Federal action significantly affecting the quality of the human environment. Therefore, an EIS is required for a plant license renewal review. The EIS requirements for a plant-specific license renewal review are specified in 10 CFR Part 51. Pursuant to 10 CFR 54.23 and 51.53(c), BGE submitted an environmental report (ER) (BGE 1998a) in which BGE analyzed the environmental impacts associated with the proposed action, considered alternatives to the proposed action, and evaluated any alternatives for reducing adverse environmental effects.

As part of NRC's evaluation of the application for license renewal, the NRC staff is required under 10 CFR Part 51 to prepare an EIS for the proposed action, issue the statement in draft form for public comment, and issue a final statement after considering public comments on the draft. This report is the final plant-specific supplement to the GEIS (SEIS) for the BGE license renewal application. The staff will also prepare a separate safety evaluation report in accordance with 10 CFR Part 54.

The following sections in this introduction describe the background and the process used by the staff to assess the environmental impacts associated with license renewal, describe the proposed Federal action, discuss the purpose and need for the proposed action, and present the status of compliance with environmental quality standards and requirements that have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. Chapters 3 and 4 discuss the potential environmental impacts of plant refurbishment and plant operation during the renewal term, respectively. Chapter 5 contains an evaluation of potential environmental impacts of plant accidents and includes consideration of severe accident mitigation alternatives (SAMAs). Chapter 6 discusses

(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.

the uranium fuel cycle and solid waste management, and Chapter 7 discusses decommissioning. The alternatives to license renewal are considered in Chapter 8. Finally, Chapter 9 summarizes the findings of the prior chapters, draws conclusions related to the adverse impacts that cannot be avoided (the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and the irreversible or irretrievable commitments of resources), and presents the recommendation of the staff with respect to the proposed action. Additional information is included in Appendices. Appendix A contains a discussion of comments on the draft SEIS issued on February 24, 1999. Appendix B lists preparers of this supplement, and Appendix C lists the chronology of correspondence between NRC and BGE with regard to this supplement. The remaining appendices are identified in subsequent sections.

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. The GEIS serves as the principal reference for all nuclear power plant license renewal EISs.

The GEIS documents the results of the systematic approach that was 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) described the activity that affects the environment, (2) identified the population or resource that is affected, (3) assessed the nature and magnitude of the impact on the affected population or resource, (4) characterized the significance of the effect for both beneficial and adverse effects, (5) determined whether the results of the analysis applied to all plants, and (6) considered whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants.

The standard of significance was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27) for assessing environmental issues as small, moderate, or large. Using the CEQ terminology, the NRC established three significance levels 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.

The GEIS assigned a significance level to each environmental issue. In assigning these levels, it was assumed that ongoing mitigation measures would continue.

The GEIS included 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 were 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) 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 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

As set forth in the GEIS, the staff assessed 93 environmental issues and determined that 69 are Category 1 issues, 22 are Category 2 issues, and two issues were not categorized. The latter two issues, environmental justice and chronic effects of electromagnetic fields, are to be addressed in a plant-specific analysis. A summary of the findings for all 93 issues is listed in Table 9.1 of the GEIS and is codified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

License Renewal Evaluation Process

An applicant seeking a renewal of its operating license is required to submit an ER as part of its application. This ER must provide an analysis of the issues listed as Category 2 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 in accordance with 10 CFR 51.53(c)(3)(ii). The ER must include a discussion of actions to mitigate adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action. Certain issues, including the need for power, the economic benefits and costs of the proposed action, economic benefits and costs of alternatives to the proposed action, and other issues not related to the environmental effects of the

proposed action and associated alternatives need not be considered in the ER in accordance with 10 CFR 51.95(c)(2). In addition, the ER need not discuss any aspect of the storage of spent fuel. Pursuant to 10 CFR 51.53(c)(3)(i) and (iv), the ER is not required to contain an analysis of any Category 1 issues unless there is significant new information on a specific issue. New and significant information is (1) information that identifies a significant environmental issue not covered in the GEIS and codified in 10 CFR Part 51, Subpart A, Appendix B, or (2) information that was not considered in the analyses summarized in the GEIS and which leads to an impact finding different from that codified in 10 CFR Part 51.

In preparing to submit its application to renew the CCNPP operating licenses, BGE implemented a process for identifying and evaluating the potential significance of new information related to environmental impacts that might be associated with the CCNPP license renewal. The process is described in a paper provided to the staff during a staff site visit in July 1998 (BGE 1998b). The process included forming a team of individuals who represent (1) the principal BGE organizations having responsibilities encompassing license renewal environmental issues, (2) the Maryland Department of Natural Resources (MDNR), and (3) BGE's vendor for environmental services. This team conducted site inspections, record and document reviews, interviews, and a CCNPP docket review in search of information that might indicate that any of the findings for Category 1 issues or analyses for Category 2 issues were invalid as applied to CCNPP or that there were potential environmental impacts associated with the CCNPP license renewal that were not addressed in the GEIS.

The NRC staff also has a process for identifying new and significant information. That process is described in detail in a draft of the *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (ESRP), NUREG-1555, Supplement 1 (February 1999 pre-publication copy) (NRC 1999b). The search for new information includes review of an applicant's ER and process for discovering and evaluating the significance of new information; review of records of public meetings and correspondence; review of environmental quality standards and regulations; coordination with Federal, State, and local environmental protection and resource agencies; and review of the technical literature. Any 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. Neither BGE or the staff has identified any new issue applicable to the CCNPP that has a significant environmental impact; one new issue (extremophiles) was identified, but was determined not to be significant.

The discussion of the environmental issues contained in the GEIS that are applicable to CCNPP is found in Chapters 3 through 7. 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 paragraphs that state the GEIS conclusion codified in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, followed by the staff's review steps 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 describe the analysis required and the SEIS sections where the analysis is presented. The SEIS sections discussing the Category 2 issues are listed immediately following the table.

The NRC prepares an independent analysis of the environmental impacts of license renewal as well as a comparison of these impacts to the environmental impacts of alternatives. The evaluation of BGE's license renewal application began with publication of a notice of acceptance for docketing (63 FR 27601, May 19, 1998). The staff published a notice of intent to prepare an EIS and conduct scoping (63 FR 31813, June 10, 1998). Two public scoping meetings were held on July 9, 1998, in Solomons, Maryland. Comments received during the scoping process were summarized in the *Environmental Impact Statement Scoping Process, Calvert Cliffs Nuclear Power Plant, Summary Report*, October 1998 (NRC 1998a).

The staff visited the CCNPP site on July 7 through 10, 1998, reviewed the comments received during scoping, and consulted with Federal, State, and local agencies. A list of the organizations consulted is provided in Appendix D of this document. Other documents related to CCNPP were also reviewed and are referenced.

The staff followed the review guidance contained in the February 1999 prepublication version of the ESRP (which was under development at the time of the BGE application). It issued requests for additional information (RAIs) to BGE by letters dated September 9, and September 28, 1998 (NRC 1998b and 1998c). BGE provided its responses in letters dated November 20, and December 3, 1998 (BGE 1998c and 1998d). The staff reviewed this information, incorporated it into its analysis, and, on February 24, 1999, issued a draft of the SEIS, which contains the preliminary results of its evaluation and recommendation.

With the publication of the EPA notice of filing of the draft SEIS (64 FR 10662, March 5, 1999), a 75-day comment period began 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 Maryland on April 6, 1999, in which the staff described the results of the NRC environmental review and answered questions related to it in order to provide members of the public with information to assist them in formulating their comments. The comment period for the CCNPP draft SEIS ended on May 20, 1999.

This report presents the staff's final analysis that considers and weighs the environmental effects of the license renewal, the environmental impacts of alternatives to license renewal, and alternatives available for avoiding adverse environmental effects. The staff considered the comments that were received during the comment period. The disposition of these comments is addressed in Appendix A of this

SEIS. The staff modified the analysis set forth in the draft SEIS to address certain comments, where appropriate. A vertical bar in the margin indicates where the staff made changes to the draft SEIS. In addition, the NRC staff's final recommendation to the Commission on whether the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable is provided in Chapter 9, "Summary and Conclusions."

1.1 The Proposed Federal Action

The proposed Federal action is renewal of the operating licenses for CCNPP Units 1 and 2. CCNPP is located in Calvert County, Maryland, approximately 64 km (40 mi) southeast of Washington, D.C., 12 km (7.5 mi) north of Solomons Island, and 96 km (60 mi) south of Baltimore. The plant has two pressurized light-water reactors, each with a design rating of 845 megawatts electric (MWe). Plant cooling is provided by a once-through heat dissipation system into the Chesapeake Bay using shoreline intake and offshore discharge structures. CCNPP provides about 12 million MW-hours of electricity annually to more than one million customers in a 5900-km² (2300-mi²) area. The current operating licenses for Unit 1 and Unit 2 expire July 31, 2014, and August 13, 2016, respectively. By letter dated April 8, 1998, BGE submitted an application to renew these operating licenses for an additional 20 years of operation (i.e., until July 31, 2034, for Unit 1 and August 13, 2036, for Unit 2).

1.2 Purpose and Need for the Action

Although a licensee must have a renewed license to operate a plant beyond the term of the existing operating license, 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 operating license 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 Commission has adopted the following definition of purpose and need (GEIS, Section 1.3):

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 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, as amended, 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 operating license is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license.

1.3 Compliance and Consultations

BGE is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. BGE provided a list in its ER of the status of authorizations from Federal, State, and local authorities for current operations as well as environmental approvals and consultations associated with CCNPP license renewal. Authorizations most relevant to the proposed license renewal action are summarized in Table 1-1. The full list of authorizations provided by BGE is included as Appendix E. MDNR coordinated reviews and interactions with other State agencies.

The staff reviewed the list and consulted with the appropriate Federal, State, and local agencies to identify any compliance or permit issues or significant environmental issues of concern to the reviewing agencies. Agency interactions identified no new compliance or permit issues or significant new environmental issues.

1.4 References

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.23, "Temporary storage of spent fuel after cessation of reactor operation—generic determination of no significant environmental impact."

10 CFR 51.53, "Postconstruction environmental reports."

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effect of renewing the operating license of a nuclear power plant."

10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR 54.23, "Contents of application—environmental information."

40 CFR 1508.27, "Terminology and Index—Significantly."

Table 1-1. Federal, State, and Local Authorizations

Agency	Authority	Requirement	License/ Permit Number	License/Permit Expiration or Consultation Date	Activity Covered
NRC	Atomic Energy Act, 10 CFR 54.23, 10 CFR Part 51	Environmental Report	DPR-53, DPR-69	OLs expire July 31, 2014, August 13, 2016	Refurbishment and operation during the renewal term
EPA	Clean Water Act, Section 401 ^(a)	State water quality certification	NA	Expires June 15, 1999 ^(b)	Discharges under NPDES of process waste water
MDE	COMAR 26.17.06	State water appropriation permit	CA69G010 (04)	Expires April 1, 2001	CCNPP use of groundwater from 5 wells in protected area
MDE	COMAR 26.17.06	State water appropriation permit	CA71S001 (02)	Expires April 1, 2001	CCNPP use of surface water for cooling
MDE	COMAR 26.08.04	State discharge permit	92-DP-0187 (MD 0002399)	Expires June 15, 1999 ^(b)	Wastewater discharge permit
FWS and NMFS	Endangered Species Act, Section 7	Consultation	NA	Consultation letters from FWS dated November 3, 1998, and from NMFS dated February 12, 1998, identifying threatened and endangered species	Operation during the renewal term
MDE	Coastal Zone Management Act	Certification by applicant that action is consistent with coastal management programs	NA	Letter from MDE to NRC dated February 12, 1998, concurring with consistency certification	Operation during the renewal term
Maryland Historic Trust	National Historic Preservation Act, Section 106	Consultation	NA	Confirmation from Maryland Historic Trust on October 22, 1997, that action is unlikely to affect properties	Operation during the renewal term

EPA - U.S. Environmental Protection Agency

MDE - Maryland Department of the Environment

FWS - U.S. Fish and Wildlife Service

NMFS - National Marine Fisheries Service

COMAR - Code of Maryland Regulations

NPDES - National Pollutant Discharge Elimination System

NA - Not applicable

(a) Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act

(b) Application to extend permit under review

63 FR 27601, "Notice of Acceptance for Docketing," May 19, 1998.

63 FR 31813, "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." June 10, 1998.

64 FR 10662 "Notice of Filing." March 5, 1999.

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

Baltimore Gas and Electric Company (BGE). 1998a. *Applicant's Environmental Report - Operating License Renewal Stage Calvert Cliffs Nuclear Power Plant Units 1 and 2*. Docket Nos. 50-317 and 50-318. Lusby, Maryland.

Baltimore Gas and Electric Company (BGE). 1998b. Attachment to Memorandum to T. Essig summarizing the site visit. "New and Significant Information Process for License Renewal of Calvert Cliffs Nuclear Power Plant." July 10, 1998.

Baltimore Gas and Electric Company (BGE). 1998c. Letters from Mr. C.H. Cruse (BGE) to NRC Document Control Desk, "Response to Request for Additional Information for the Review of the Calvert Cliffs Nuclear Power Plant Unit Nos. 1 & 2, Environmental Report Associated with License Renewal, and Errata (TAC Nos. MA1524 and M1525)," November 20, and December 3, 1998, Lusby, Maryland.

Coastal Zone Management Act, as amended (CZMA), 16 USC 1455 *et seq.*

Endangered Species Act (ESA), as amended, 7 USC 136; 16 USC 460 *et seq.*

Federal Water Pollution Control Act (FWPCA) (also known as the Clean Water Act), as amended, 33 USC 121 *et seq.*

National Environmental Policy Act of 1969, as amended, 42 USC 4321, *et seq.*

National Historic Preservation Act, as amended, 16 USC 470 *et seq.*

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

U.S. Nuclear Regulatory Commission (NRC). 1998a. *Environmental Impact Statement Scoping Process: Summary Report-Calvert Cliffs Nuclear Power Plant, Lusby, Maryland*. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1998b. Letter from Ms. C.M. Craig (NRC) to Mr. C.H. Cruse (BGE), "Request for Additional Information for the Review of the Calvert Cliffs Nuclear

Introduction

| Power Plant (CCNPP) Unit Nos. 1 & 2, License Renewal Application, Severe Accident Mitigation
| Alternatives (TAC Nos. MA 1524 and MA 1525)," September 9, 1998, Washington, D.C.

| U.S. Nuclear Regulatory Commission (NRC). 1998c. Letter from Ms. C.M. Craig (NRC) to Mr.
| C.H. Cruse (BGE), "Request for Additional Information for the Review of the Calvert Cliffs Nuclear
| Power Plant (CCNPP) Unit Nos. 1 & 2, Environmental Report Associated with License Renewal (TAC
| Nos. MA 1524 and MA 1524)," September 28, 1998, Washington, D.C.

| U.S. Nuclear Regulatory Commission (NRC). 1999a. *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.* NUREG-1437 Vol. 1, Addendum
| 1, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *Standard Review Plans for Environmental
Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, NUREG-1555,
Supplement 1. Washington, D.C.

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

CCNPP is located near Maryland Highway 2-4 in Calvert County on the west bank of the Chesapeake Bay, approximately halfway between the mouth of the Bay and its headwaters at the Susquehanna River. CCNPP is a two-unit plant. Each unit is equipped with a Combustion Engineering Nuclear Steam Supply System pressurized light-water reactor and uses once-through cooling with water from the Chesapeake Bay. CCNPP supplies more than 12 million megawatt-hours annually to customers in a 5900-km² (2300-mi²) area. The electricity generated is transferred through a power transmission system that consists of two transmission lines to the Waugh Chapel Substation on the Northern Circuit and a single transmission line to the Chalk Point Generating Station on the Southern Circuit. Descriptions of the plant and its environs follow 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

CCNPP is located on 853 hectares (ha) (2108 acres) in a rural part of southern Maryland on wooded and agricultural lands. It draws its workforce of about 1550 from surrounding communities, and is the major employer in the area. Several small communities are located within a 16-km (10-mi) radius of the site. The population density of the area increases with seasonal summer residents. The population density increases with distance to the northwest and the 80-km (50-mi) radius includes a portion of the Washington, D.C., metropolitan area. Baltimore is 96 km (60 mi) to the north. Figures 2-1 and 2-2 illustrate the plant location with respect to the Chesapeake Bay and the Patuxent River.

The property consists of rolling hills, part of it forested primarily with deciduous trees. There is an understory of grasses, herbs, and shrubs. Part of the land is cultivated under an experimental pest control/fertilization program, and hay, corn, and wheat are routinely cultivated. About 89 ha (220 acres) of the site were altered for plant and auxiliary structures. About 30-40 ha (75-100 acres) of CCNPP borders the Chesapeake Bay. Most of this Bay frontage has near-perpendicular walls. Bay frontage elevation varies from sea level to about 42 m (137 ft) with an average of about 30 m (100 ft).

The topography of the vicinity around the plant defines several small watersheds. The watershed containing the plant and the auxiliary structures drains into the Chesapeake Bay. Part of the upper areas, used primarily during the construction period, drains through the Johns Creek watershed into the St. Leonard Creek, which then drains into the Patuxent River approximately 7 km (4 mi) from the plant. The Patuxent River drains into the Chesapeake Bay approximately 16 km (10 mi) south of the plant.

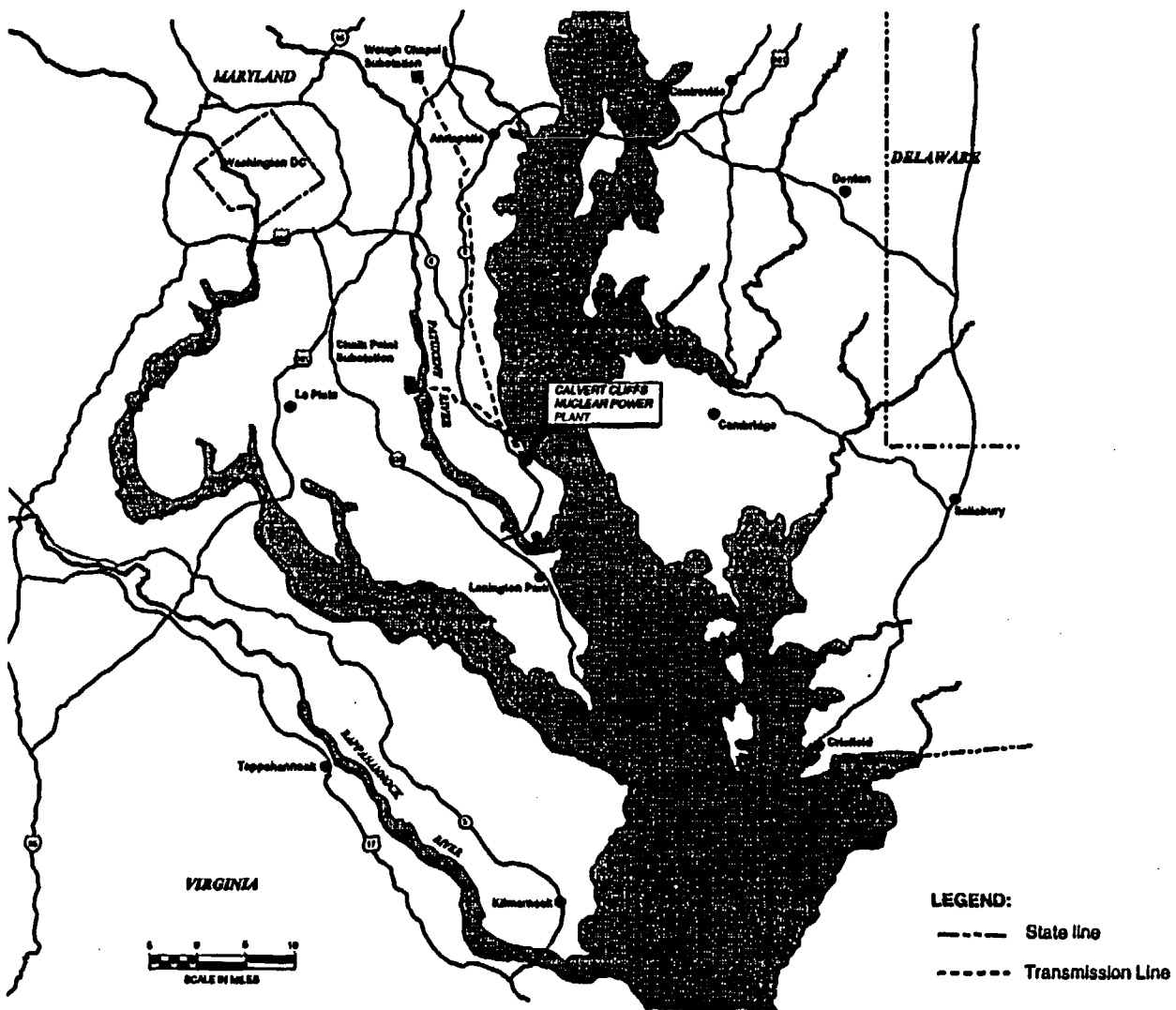


Figure 2-1. Calvert Cliffs Nuclear Power Plant Site Area, 50-Mile Region

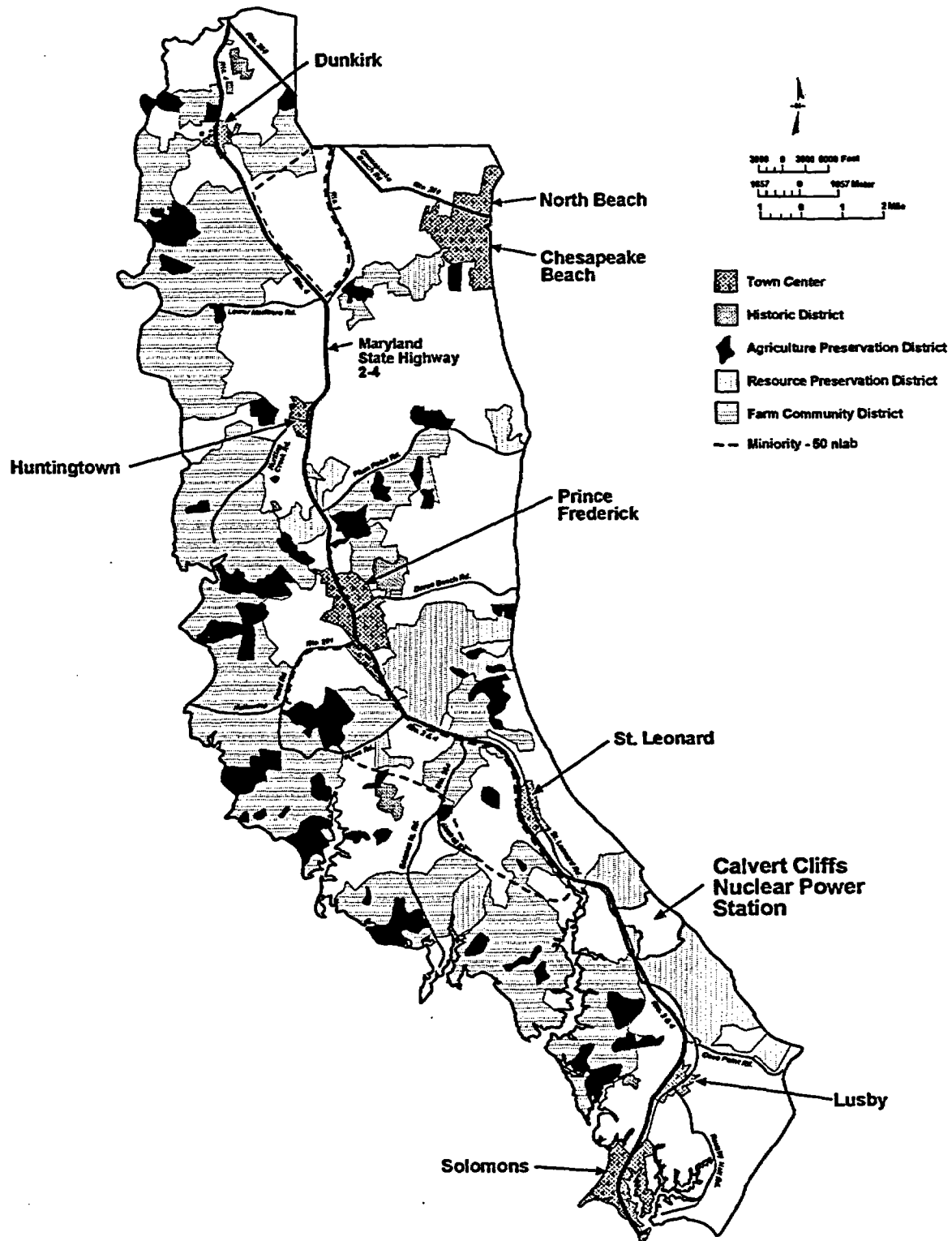


Figure 2-2. Calvert Cliffs Nuclear Power Plant Site Area, Land Uses and Growth Protection Areas

Chesapeake Bay is approximately 313 km (195 mi) long and varies in width from 5 to 56 km (3 to 35 mi) with an average width of 24 km (15 mi) (Figure 2-1). The Bay has an average depth of approximately 9 m (30 ft) and receives the majority of its fresh water, sediment, and nutrients from the Susquehanna River. The Susquehanna watershed encompasses three states, and its flow dominates the circulatory patterns in the upper Bay during the spring months, with the majority of the net flow directed seaward at all depths (K. G. Sellner and B. A. Peters in Heck 1987). Circulation in the Bay is typical of a partially mixed estuary with non-tidal and tidal components producing a net seaward-moving fresh water surface layer and a landward-moving saline layer (Pritchard 1967). The Chesapeake Bay is about 10 km (6 mi) wide at the plant site from its western shore to Taylors Island.

2.1.1 External Appearance and Setting

CCNPP is sited within a forested natural saddle along the Calvert Cliffs, providing a low profile for the plant. The tallest structures do not rise above the top of the surrounding tree line when viewed from the land areas or from the water. The Turbine Building, which houses two turbine generators and ancillary equipment, is the largest structure on the site and parallels the shoreline of the Bay. Twin containment structures and the Auxiliary Building are located to the west of the Turbine Building. The Intake Structure is located east (bayside) of the Turbine Building. The buildings and the switchyard were designed to minimize their visual impact. Disturbed areas are landscaped or otherwise maintained.

Although several additional facilities have been constructed at CCNPP since 1973, the plant, as it appears from the Chesapeake Bay, has changed little. Figures 2-3 and 2-4 show the station in detail, highlighting those permanent facilities constructed since plant operation began. Figure 2-5 is a low-level aerial photograph of CCNPP taken from the Bay looking south-southwest that shows the major plant structures, including the Turbine Building and twin containment structures. The Interim Office Building, Intake Structure, North Service Building, and Sewage Treatment Plant are also visible from the Bay. Most of the other new facilities are visible only from the air due to intervening buildings and wooded hillsides. Except for the Independent Spent Fuel Storage Installation, which has a separate NRC license, all of the additional facilities are located on areas previously disturbed during CCNPP construction.

The onsite Visitors Center is located in a remodeled old working frame tobacco barn, part of which was built in 1818 (Stone 1978). The center displays historic artifacts, dioramas, and animated exhibits that cover the history of the location, and focuses on the site's present use for nuclear power generation. The Visitors Center area also includes the stabilized foundation and chimneys of a small Maryland plantation house of the 18th century, known as "Preston's Cliffs," and a historic log tobacco barn that is reported to be the oldest of its kind still standing in Maryland. The log barn was constructed in 1820. In addition to the Visitors Center, BGE maintains a nature trail that begins at the historic house foundation and includes highlights of the area's historical and natural setting, including the Chesapeake Bay and its shoreline ecology.

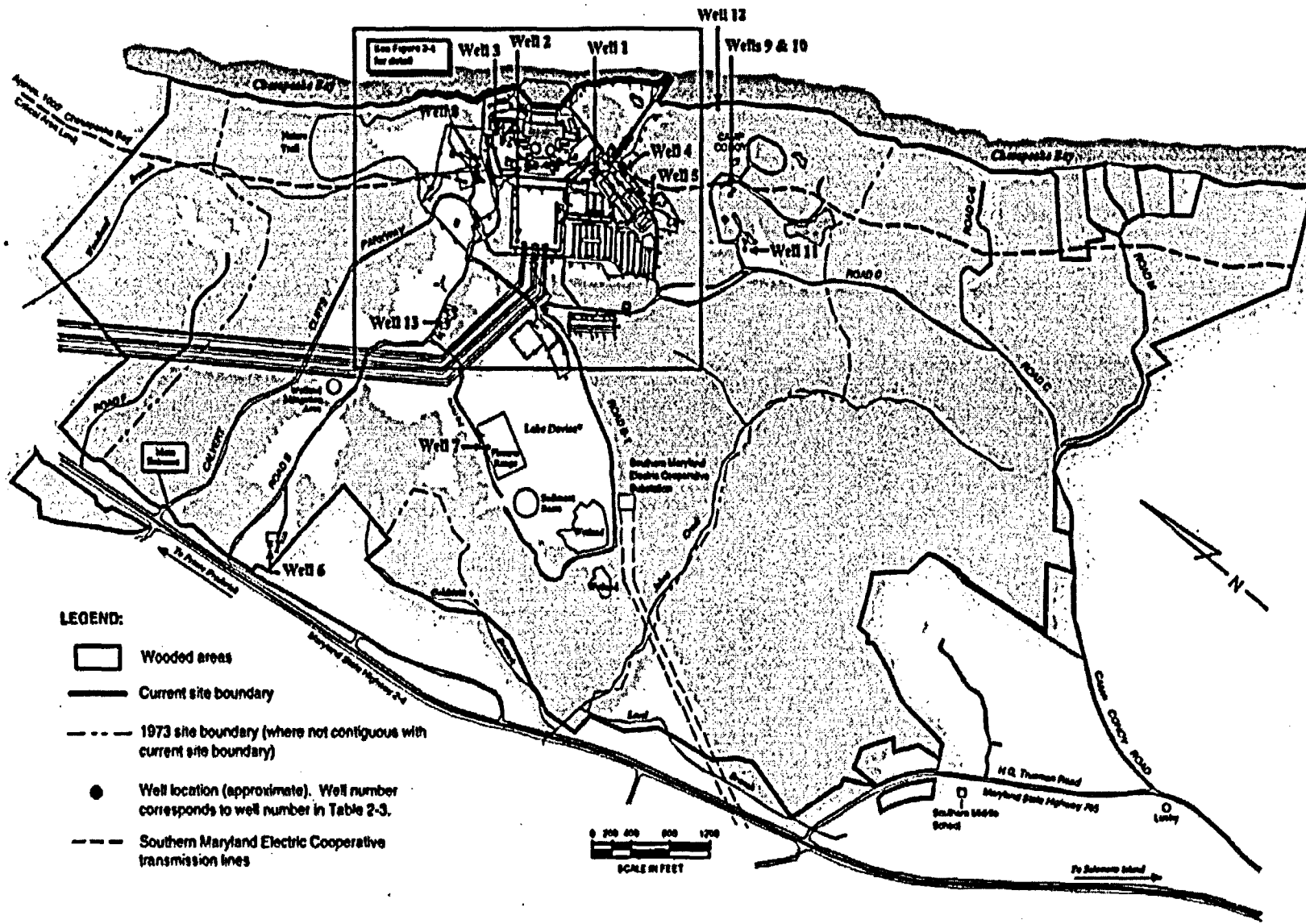


Figure 2-3. Calvert Cliffs Nuclear Power Plant Site Layout and Well Locations

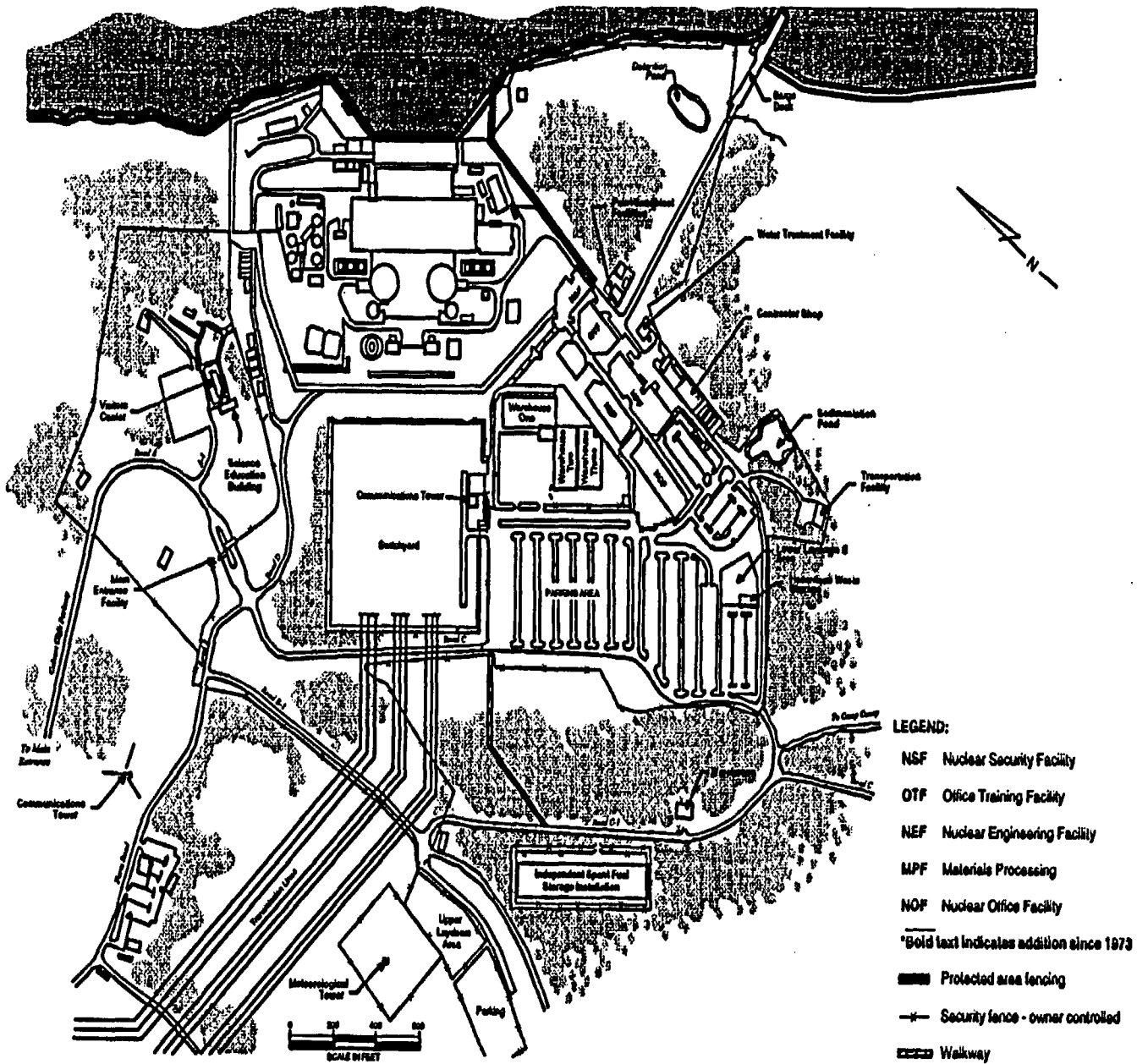
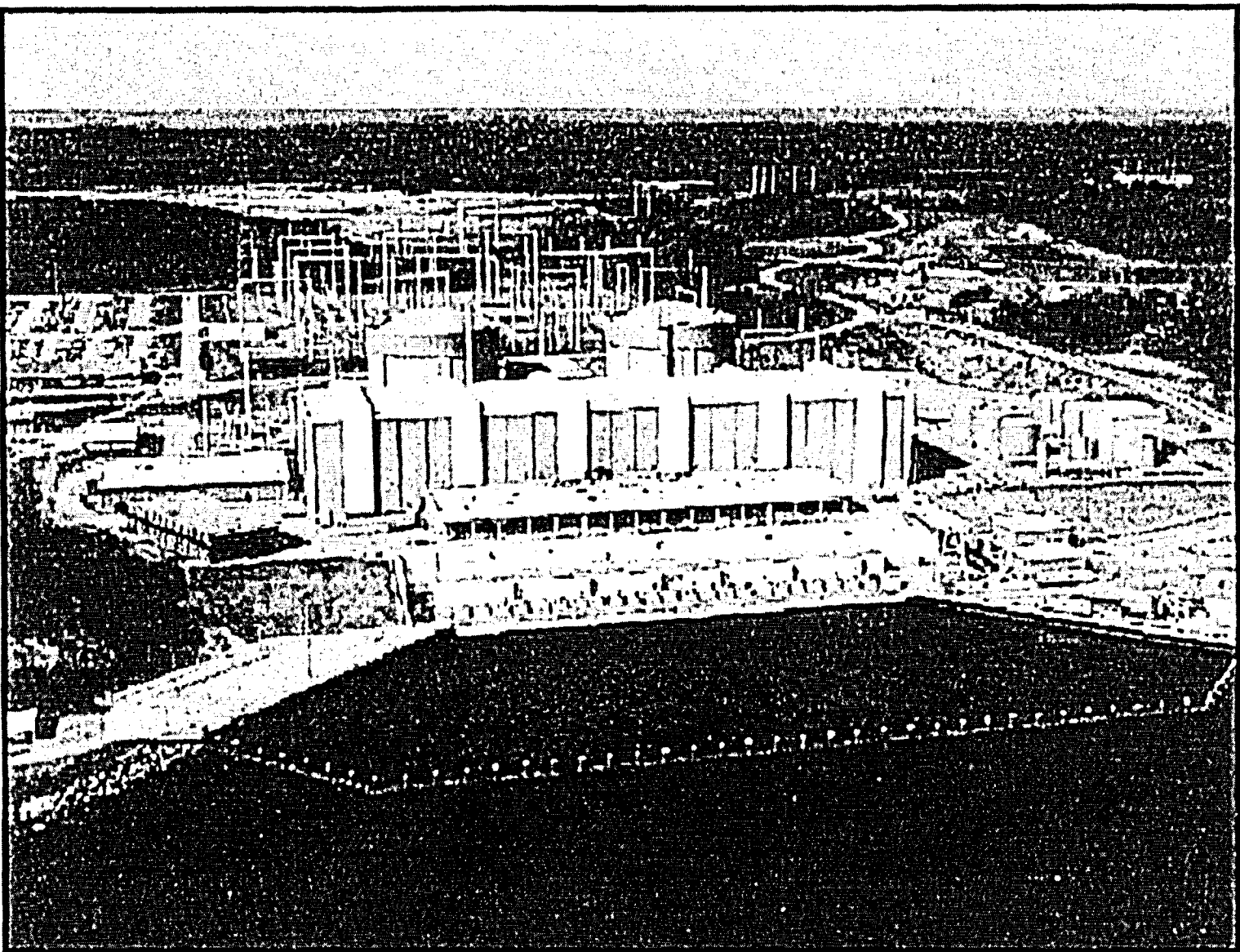


Figure 2-4. Calvert Cliffs Nuclear Power Plant Station Layout



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Figure 2-5. Calvert Cliffs Nuclear Power Plant (aerial photo)

The site's geologic setting lies within the Coastal Plain Physiographic Province, and is underlain by approximately 760 m (2500 ft) of sedimentary strata. Underlying these sediments are crystalline and metamorphic basement rock.

There is no evidence of faulting in the site vicinity. As shown in Figure 2-6, the strata range from nearly horizontal to gently dipping to the southeast, reflecting the influence of the basement rock slope. Areas above an elevation of 21 m (70 ft) are Pliocene and Pleistocene silt and sand, and are underlain by approximately 82 m (270 ft) (Elevation +70 to -200 feet mean sea level [MSL]) of the relatively impervious sediments of the Chesapeake group of Miocene age; the CCNPP power block area is Elevation +45 feet MSL. The Miocene-age sediments consist of horizontally stratified sandy and clayey silt with occasional interbeds of sands and shells. Approximately 106 m (350 ft) (Elevation -200 to -550 feet MSL) of dense, relatively pervious glauconitic sand and silt of the Eocene and Paleocene age underlie the Miocene sediments.

The site includes a portion of the Calvert Cliffs, noted for scenic and scientific significance. Some of the fossils recovered at the site during an in-depth paleoecological study of the Miocene deposits are displayed at the Visitors Center.

Table 2-1 provides a brief summary of groundwater aquifers beneath CCNPP.

The site water table occurs generally within 9 m (30 ft) (above Elevation +70 feet MSL) of the surface in Pleistocene-age deposits. Groundwater flow within approximately 300 m (1000 ft) of the Chesapeake Bay at CCNPP is toward the Bay; flow west of the divide is toward surface stream valleys. Surficial soil grain size analysis suggests a maximum permeability coefficient of about 6.1×10^{-4} m/s (400 gpd/ft²).

Surficial deposits are underlain by approximately 75 m (250 ft) of relatively impermeable deposits, known as the Chesapeake Group, which effectively confine the underlying artesian aquifers. The vertical component of groundwater movement through the Chesapeake Group is upward. Underlying aquifers are composed of glauconitic sand and silt of the Piney Point, Nanjemoy, and Aquia formation. The Piney Point and Nanjemoy Aquifers act as a single unit, but are separated from the underlying Aquia Aquifer by a layer of clay and silt called the Nanjemoy-Marlboro confining unit. The Aquia Aquifer beneath CCNPP is approximately 30 m (100 ft) thick (from Elevation -450 to -550 feet MSL).

2.1.2 Reactor Systems

CCNPP is a two-unit plant. Each unit is equipped with a Combustion Engineering Nuclear Steam Supply System that uses a pressurized light-water reactor and two steam generators. Each unit has a design rating for net electrical power output of 845 MW. The two CCNPP reactors are operated at a maximum core thermal power output level of 2700 MW. The Unit 1 turbine generator is a General Electric Company design, and Unit 2 is a Westinghouse Electric Corporation design. Each turbine is an 1800-rpm tandem compound, six-flow exhaust, indoor unit (BGE 1998a).

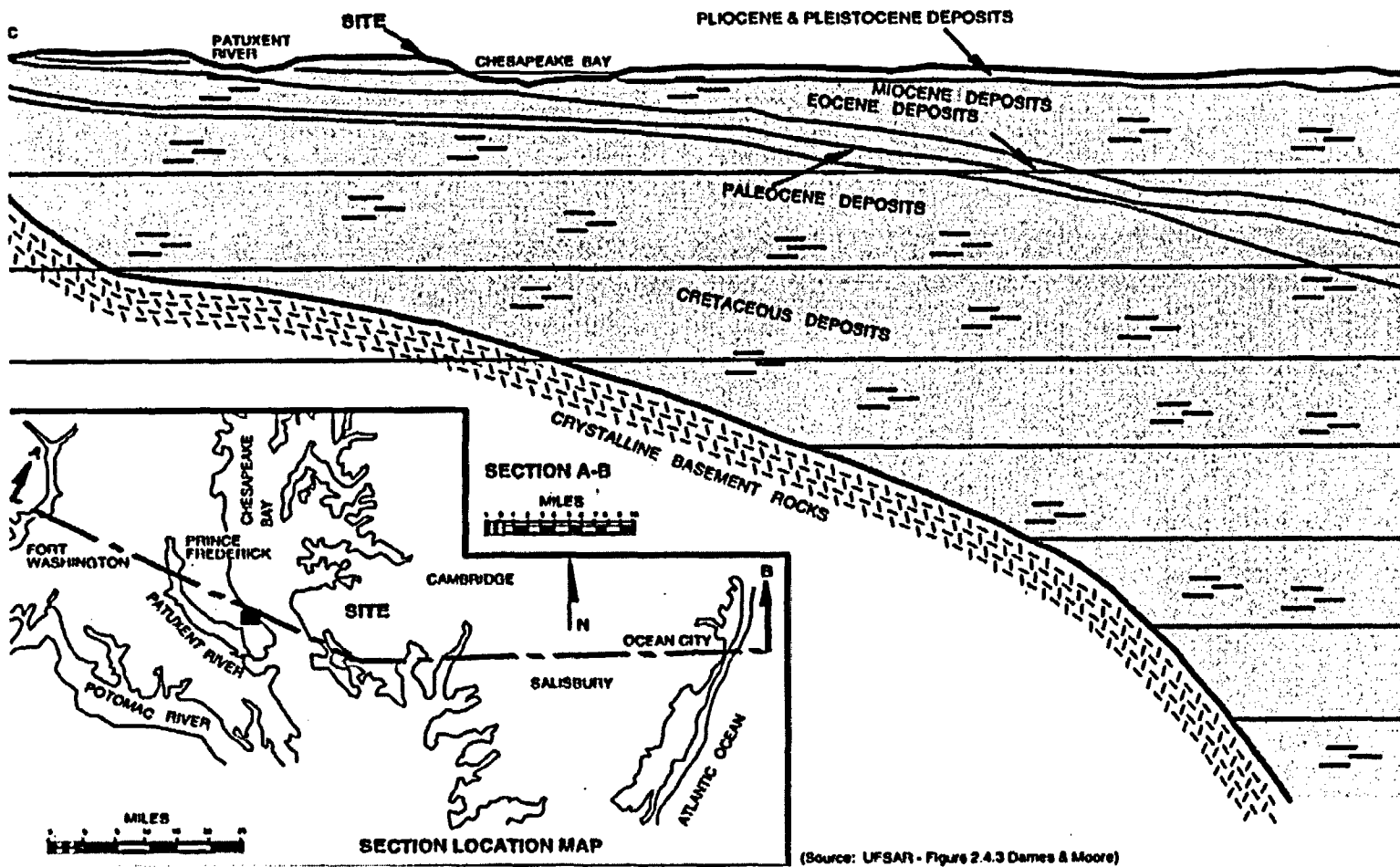


Figure 2-6. Regional Geological Section - Coastal Plain

Table 2-1. A Summary of Groundwater Aquifers Beneath CCNPP^(a)

Description	Physical Description	Water-Bearing Properties	Thickness in Region m (ft)	Approximate Elevation at CCNPP^(b) m (ft)
Surficial deposits	Silt, sand, and some clay	Small quantities of water to shallow wells	0 - 46 (0 - 150)	Above +21 (Above +70)
Chesapeake Group	Sandy and clayey silt	Yields small amounts of water in a few dug wells	9 - 99 (30 - 325)	Between +21 and -61 (Between +70 and -200)
Piney Point Formation	Glauconitic sand	Yields up to 12.6 L/s (200 gpm). Important aquifer in Calvert County	0 - 18 (0 - 60)	Between -61 and -73 (Between -200 and -240)
Nanjemoy Formation	Glauconitic sand with clayey layers	Yields up to 3.8 L/s (60 gpm) reported. Important aquifer in Calvert County	12 - 73 (40 - 240)	Between -240 and -300 (Between -240 and -300)
Nanjemoy-Marlboro	Clay, silt	Confining unit	0 - 213 (0 - 700)	Between -91 and -137 (Between -300 and -450)
Aquia Formation	Green to brown glauconitic sand	Yields up to 18.9 L/s (300 gpm). Important aquifer in Southern Maryland	9 - 61 (30 - 200)	Between -137 and -168 (Between -450 and -550)

(a) Source: BGE 1998a.

(b) Elevations are above (+) or below (-) MSL.

CCNPP fuel is slightly enriched uranium dioxide in the form of pellets contained in zirconium alloy fuel rods (tubes fitted with welded end caps). CCNPP was originally licensed to use fuel having a uranium-235 enrichment not exceeding 4 percent by weight.^(a) In 1981, NRC authorized an increase in fuel enrichment up to 4.1 percent uranium-235. In 1989, NRC authorized another increase to 5 percent uranium-235; at the same time, NRC also authorized an increase the in level of CCNPP fuel burnup,^(b) above the original 33,000 megawatt-days per metric tonne uranium (MWd/MTU) to 60,000 MWd/MTU.

Reactor containment structures are designed with engineered safety features to protect the public and plant personnel from accidental release of radioactive fission products, particularly in the unlikely event of a loss of coolant accident (LOCA). These safety features function to localize, control, mitigate, and terminate such events to limit exposure levels below applicable dose guidelines. The reactor is controlled using a combination of chemical controls (boric acid dissolved in coolant water) and solid absorber material (tubes of boron carbide).

(a) Naturally occurring uranium contains several forms of uranium, including approximately 0.7 percent uranium-235, the form that a nuclear reactor uses. The nuclear fuel manufacturing process removes some of the other forms, resulting in a slightly higher percentage ("enrichment") of uranium-235.

(b) "Burnup" is the length of use of, or total energy generated by, the nuclear fuel, and is measured as megawatt-days per metric tonne uranium.

2.1.3 Cooling and Auxiliary Water Systems

CCNPP is equipped with a once-through heat dissipation system that withdraws cooling water from and discharges it to the Chesapeake Bay. This circulating water system removes heat from the plant and transfers this energy to the Chesapeake Bay. There are no cooling towers associated with this system.

CCNPP uses water from the Chesapeake Bay for cooling purposes, drawing bottom water through a 15-m (45-ft) deep dredged channel that extends approximately 1380 m (4500 ft) offshore. Water passes through the plant in approximately 4 minutes and is discharged to the north of the plant from an outfall that is approximately 260 m (850 ft) offshore in 3 m (10 ft) of water. A curtain wall that extends to a depth of 9 m (30 ft) over the intake channel limits the intake to mostly bottom water, although there is evidence that mixing of surface and lower depth water occurs before entrance into the plant (Heck 1987). The intake and discharge structures are shown in Figure 2-7.

Each generating unit has three separate water loops. The primary coolant loop is a closed piping system—pressurized water in the system is circulated through the reactor and transfers heat from the reactor to the steam generator. The primary coolant system for each unit consists of a reactor, two steam generators, two reactor coolant loops, and four reactor coolant pumps. The secondary loop is also a closed system—water from this system is converted into steam (in the steam generators) that is used to drive the turbine. The third loop is an open system—water from Chesapeake Bay is used to cool the spent steam in the secondary loop and then is returned to the Bay.

The principal components of the circulating water system are the curtain wall, intake structure, circulating water pumps, condensers, and discharge conduits.

CCNPP has five groundwater production wells that supply process and domestic water in the protected area of the plant (Figure 2-3), and eight wells that supply water for domestic use in outlying areas. The production wells extend into the Aquia Aquifer. Although a gravity drain system was installed during original plant construction to dewater plant areas, CCNPP does not use dewatering pumps for plant operation.

Groundwater wells provide the source of water for domestic, plant service and demineralized make-up water needs, while the Chesapeake Bay is the source of water for the once-through cooling system. All effluents are combined before being discharged through the submerged outfall to the Chesapeake Bay. Both the quantity of water pumped (from both the groundwater wells and the Chesapeake Bay) and quality of the water discharged to the Chesapeake Bay are regulated and permitted by the State of Maryland.

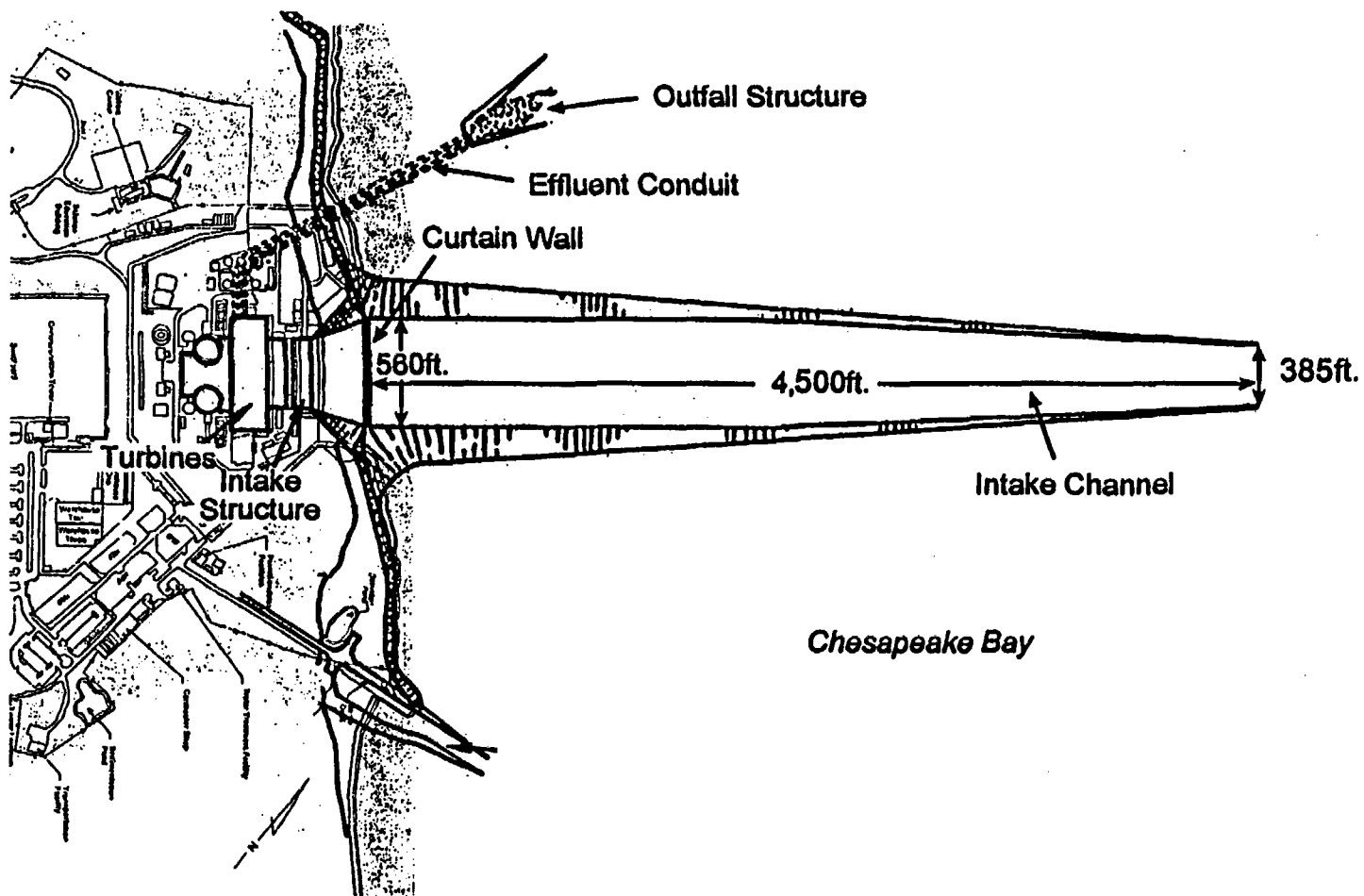


Figure 2-7. Intake and Discharge Structures

2.1.4 Radioactive Waste Management Systems and Effluent Control-Systems

The CCNPP waste processing systems meet the design objectives of 10 CFR Part 50, Appendix I, and control the processing, disposal, and release of radioactive liquid, gaseous, and solid wastes (BGE 1997). Radioactive material in the reactor coolant is the source of gaseous, liquid, and solid radioactive wastes in light-water reactors (LWRs). Radioactive fission products build up within the fuel as a consequence of the fission process. These fission products are contained in the sealed fuel rods, but small quantities escape the fuel rods and contaminate the reactor coolant. Neutron activation of the primary coolant system also is responsible for coolant contamination.

Non-fuel 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 discarded reactor components, equipment, and tools as well as contaminated protective clothing, paper, rags, and other trash largely from plant design and operations modifications and routine maintenance activities. Certain dry wastes may be shredded or compacted under high pressure to reduce disposal volume. Spent resins, filters, and evaporator concentrates are dewatered and stored or packaged for shipment to an offsite processing or disposal facility.

Fuel rods that have exhausted a certain percentage of their fuel and are removed from the reactor core for disposal are called spent fuel. CCNPP currently operates on a 24-month refueling cycle and stores all its spent nuclear fuel onsite either in a spent fuel pool in the Auxiliary Building or in dry storage at its Independent Spent Fuel Storage Installation (BGE 1992). CCNPP also temporarily stores mixed waste onsite. This storage is governed by the Atomic Energy Act (AEA) for radioactive material and the Resource Conservation and Recovery Act (RCRA) for hazardous waste, consistent with NRC and EPA requirements (42 USC 2011-2259 [AEA]; 42 USC 6901 [RCRA]) and in accordance with an agreement with the Maryland Department of the Environment (MDE).

There are four waste processing systems: the Reactor Coolant Waste Processing System (RCWPS), the Miscellaneous Waste Processing System (MWPS), the Waste Gas Processing System (WGPS), and the Solid Waste Processing System (SWPS).

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

Radioactive liquid waste generated from the operation of CCNPP can be released to the Chesapeake Bay in accordance with the limits specified in the CCNPP Offsite Dose Calculation Manual (ODCM). There are four outfalls that provide the pathways for all waste water (non-radioactive and radioactive) discharged into the Bay.

CCNPP liquid waste is processed by two systems: (1) the RCWPS, which processes reactor coolant concurrent with the letdown flow from the Chemical and Volume Control System (CVCS), and (2) the MWPS, which processes waste from miscellaneous sources. The liquid waste processing systems are used to reduce the radioactive material in liquid wastes before discharge when the activity in the effluent could exceed the ODCM limits.

The RCWPS provides temporary storage for reactor coolant waste (RCW) to allow for radioactive decay to maintain releases to the environment as low as reasonably achievable (ALARA), as well as maintain the concentration of radioactive isotopes in the effluent below the ODCM limits. Sampling and release of liquid waste is performed on a batch basis, rather than a continuous basis, to provide better control over effluent discharge.

The RCWPS consists of two reactor coolant drain tanks (RCDTs), three cartridge filters, four RCW ion exchangers, two RCW receiver tanks, two evaporators, two RCW monitoring tanks, and various system pumps. The system simultaneously processes reactor coolant and CVCS letdown flow from both Unit 1 and Unit 2.

Before being transferred to the two RCW receiver tanks, the RCW liquid is filtered to remove insoluble corrosion products and then degasified to remove hydrogen, nitrogen, and fission gases. The liquid is pumped to ion exchangers that remove soluble ions, thereby resulting in an effluent that is reduced in total activity. The liquid is then routed to the RCW monitor tank where it is sampled. If the activity level in the monitor tank is within discharge limits, then the liquid may be released in a controlled, monitored fashion to meet the administrative limits in the ODCM.

Controls for limiting the release of radiological liquid effluents are described in the ODCM. Controls are based on (1) concentrations of radioactive materials in liquid effluents and projected dose or (2) dose commitment to a member of the public. Concentrations of radioactive material that may be released in liquid effluents to unrestricted areas are limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II.^(a) The dose limits are 0.03 millisievert (mSv) (3 mrem) to the whole body and 0.10 mSv (10 mrem) to any organ during any calendar quarter and 0.06 mSv (6 mrem) to the whole body and 0.20 mSv (20 mrem) to any organ during a calendar year. Radioactive liquid wastes are subject to the sampling and analysis program described in the ODCM.

2.1.4.2 Gaseous Waste Processing System and Effluent Controls

Radioactive gaseous waste generated from operation of CCNPP may be released to the atmosphere through the Unit 1 and Unit 2 main vent stacks, the auxiliary boiler deaerator, the steam generator atmospheric steam dump system, the plant nitrogen system, the turbine building ventilation exhaust, the

(a) CCNPP is authorized to use the previous version of 10 CFR Part 20, Appendix B, Table II (the current version is Table 2).

emergency air lock, the plant compressed air system, the main steam line penetrations, the containment equipment hatch, and the auxiliary feedwater pumps.

During normal operation, the WGPS is designed to store the gases removed from liquid waste to allow for radioactive decay before release. The WGPS consists of a surge tank, two compressors, three waste gas decay tanks and a high-efficiency particulate air (HEPA) filter. The WGPS collects, stores, and disposes of gaseous waste from the degasifiers, pressurizer quench tanks, RCDTs, the volume control tanks, and other miscellaneous hydrogenated sources.

There are other potential sources of gaseous releases from the plant that are not collected in the WGPS. Leaks from reactor coolant containment structures, condenser air removal systems, and other potential sources are released through the plant vent. The following are the pathways for gaseous effluents containing or potentially containing radioactive material:

- WGPS
- containment structure purge
- containment hydrogen purge system
- auxiliary building ventilation
- condenser air removal system and gland seal exhaust
- aerated tank vents
- turbine building ventilation.

BGE maintains all gaseous releases within ODCM limits. Potential release pathways are sampled according to approved plant procedures.

The WGPS is used to reduce the radioactive material in gaseous waste before discharge to meet the dose design objectives in 10 CFR Part 50, Appendix I. In addition, the limits in the ODCM are designed to provide reasonable assurance that radioactive material discharged in gaseous effluents would not result in the exposure of a member of the public in an unrestricted area in excess of the limits specified in 10 CFR Part 20, Appendix B.

The quantities of gaseous effluents released from CCNPP are controlled by the administrative limits defined in the ODCM. The controls are specified for dose rate, dose due to noble gases, and dose due to iodine and radionuclides in particulate form. For noble gases, the dose rate limit at or beyond the site boundary is 5 mSv/yr (500 mrem/yr) to the whole body, and 30 mSv/yr (3000 mrem/yr) to the skin. For iodine and particulates with half lives greater than eight days, the limit is 15 mSv/yr (1500 mrem/yr) to any organ. The limit for air dose due to noble gases released in gaseous effluents to areas at or beyond the site boundary during any calendar quarter is 0.1 milligray (mGy) (10 mrad) for gamma radiation and 0.2 mGy (20 mrad) for beta radiation, and, for any calendar year, the limit is 0.2 mGy (20 mrad) for gamma radiation and 0.4 mGy (40 mrad) for beta radiation. The radioactive gaseous waste sampling and analysis program specifications are provided in the ODCM, and address the gaseous

release type, sampling frequency, minimum analysis frequency, type of activity analysis, and the lower limit of detection. The WGPS is used to reduce radioactive material in gaseous waste before its discharge when the gaseous effluent air doses due to gaseous effluent releases to the area at and beyond the site boundary are projected to exceed 0.012 mGy (1.2 mrad) for gamma radiation and 0.024 mGy (2.4 mrad) for beta radiation in a 92-day period.

2.1.4.3 Solid Waste Processing and Handling

Solid waste is packaged in containers to meet the applicable requirements of 49 CFR Parts 171 through 177. Disposal and transportation are performed in accordance with the applicable requirements of 10 CFR Parts 61 and Part 71, respectively. The SWPS provides the capability for preparing solid waste for shipment to an offsite disposal facility or processor. The system is designed to minimize radiation exposure to personnel during the handling of solid wastes.

The SWPS equipment is located in the Auxiliary Building. Spent radioactive ion exchanger resin is sluiced to a tank where it is stored and partially dewatered. It is then prepared for shipment. RCWPS evaporator bottoms are normally recycled or otherwise processed in accordance with BGE's Process Control Program. Radioactive filters are transported from each filter housing to the waste disposal area. All solid wastes are packaged in containers suitable for transfer to an offsite processor or disposal.

The Materials Processing Facility (MPF) provides interim storage of dry active waste (DAW) until such waste can be shipped to a permanent disposal facility or a processing facility. The storage capacity of the MPF can accommodate more than five years of expected waste generated at CCNPP, based on normal operation and generation. Provisions are in place for additional expansion, if needed. The design life of the MPF is expected to meet the needs of the license renewal term. The functions of the MPF are interim storage of DAW and low-level processed wastes; decontamination of clothing, respirators, tools, hardware, and radioactive waste material; temporary holding of liquid wastes generated from the laundry; receiving, sorting, compacting, packaging, and offsite return shipment of DAW; office space for radwaste management activities; additional storage of spare plant equipment and components; and processing of liquid waste in the decontamination facility in preparation for offsite shipment.

There are two areas for resin storage: (1) the interim resin storage facility located in the Lake Davies area (waste is limited to spent resins and filters); and (2) the West Road Cage located west of the Auxiliary Building.

All CCNPP radioactive waste shipments are packaged in accordance with NRC and U.S. Department of Transportation requirements. CCNPP currently transports shipments of radioactive material to

- high-level waste examination sites

- low-level waste disposal site (Barnwell, South Carolina)
- offsite processing facility for segregation, recycling, compaction, decontamination, and incineration.

CCNPP also transports material from an offsite processing facility to a disposal site or back to the plant site for reuse or storage.

2.1.5 Nonradioactive Waste Systems

Nonradioactive waste is produced from plant maintenance and cleaning processes. Most of these wastes are from boiler blowdown (as impurities are purged from plant boilers), water treatment sludges and other wastes, boiler metal cleaning wastes, floor and yard drains, and stormwater runoff. Chemical and biocide waste sources are produced from processes to control the pH in the coolant, to control scale, to control corrosion, and to regenerate resins, as well as for cleaning and condenser defouling. Wastes may be discharged as separate point sources or combined with the cooling water discharges. Sewage sludge is transported for offsite disposal. The MDE is responsible for permitting the disposal of nonradioactive liquid and solid wastes.

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. Some of the maintenance activities conducted at CCNPP include inspection, testing, and surveillance to maintain the current licensing basis of the plant and to ensure compliance with environmental and public safety requirements. Certain of these activities can be performed while the reactor is operating. Others require that the plant be shut down. Long-term outages are scheduled for refueling and for maintenance, modification, and replacement of major components. Scheduled refueling outages generally last for about two months and occur at 1- to 2-year intervals. Periodic in-service inspections may last 2 to 4 months, while other outages vary, depending on the components being replaced.

BGE 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. It also reviewed its surveillance, on-line monitoring, inspections, testing, trending, and recordkeeping (SMITTR) program, and identified the need for new and modified programs that could lead to additional periodic monitoring or to eventual modification, replacement, or repair of selected components.

Some of the activities listed in Tables 2-7 and B.2 of the GEIS (NRC 1996) have been or are being conducted at CCNPP. For example, the plant is replacing its steam generators during its current license term and, consequently, this replacement does not meet the definition of a license renewal term refurbishment activity. The CCNPP IPA, conducted under 10 CFR Part 54, did not identify major refurbishment or replacement activities necessary to maintain the functionality of important systems,

structures, and components during the CCNPP license renewal term. Therefore, BGE expects to conduct normal refueling and 5- and 10-year inservice inspections, but plans no refurbishment outages specific to license renewal.

2.1.7 Power Transmission System

The CCNPP power transmission system includes the North Circuit, which consists of two separate three-phase 500-kV transmission lines (single right-of-way) from CCNPP to the Waugh Chapel Substation in Anne Arundel County (Figure 2-1), and the single-line South Circuit from CCNPP northwest to the Potomac Electric Power Company (PEPCO) Chalk Point generating station. Approximately 35 km (22 mi) of the lines in the northern circuit are in Calvert County and approximately 40 km (25 mi) are in Anne Arundel County in a 106- to 122-m wide (350- to 400-ft) rights-of-way. These lines were constructed to deliver power generated at CCNPP to the Waugh Chapel Substation, located at a point near BGE's load center. Each line consists of about 182 lattice towers and about 47 stylized poles. The lines cross mostly second-growth hardwood and pine forests, pasture, and farmland.

In 1994, BGE completed the South Circuit 500-kV line, shifting approximately 1.6 km (1 mi) of the original lines to make room for the new South Circuit lines at the point where the North and South Circuit routes diverge (Figure 2-1). The 29 km (18-mi) South Circuit parallels the Waugh Chapel lines from CCNPP north approximately 14 km (9 mi) before diverging in a northwesterly direction to connect with a line at the PEPCO Chalk Point generating station (Figure 2-1). BGE owns the land beneath the North and South Circuit lines.

At the time that BGE constructed CCNPP, the Southern Maryland Electric Cooperative constructed a 69-kV transmission line to CCNPP, connecting to an onsite substation (Figure 2-3) to provide CCNPP with offsite power. The plant is connected to the substation via underground lines. After CCNPP decommissioning, the Southern Maryland Electric Cooperative plans to discontinue the transfer of energy over these lines.

2.2 Plant Interaction with the Environment

Subsections 2.2.1 through 2.2.8 provide general descriptions of the environment as background information and detailed descriptions where needed to support analysis of potential environmental impacts of operation during the renewal term discussed in Chapter 4. Subsection 2.2.9 describes the historic and archaeological resources in the area, and 2.2.10 describes possible cumulative effects of the proposed action and other Federal project activities.

2.2.1 Land Use

CCNPP is located in a sparsely populated area that is undergoing population growth. The major portion of the land surrounding the site is devoted to agricultural and forest uses. While declining, the amount of land being farmed should continue to be substantial. Land devoted to residential and commercial use will increase as the population grows.

The land occupied by the CCNPP is zoned I-1 light industrial by Calvert County. Power generating facilities are a permitted use in I-1 zoning districts (Calvert County 1997a).

The amount of land devoted to various land uses in Calvert County in 1993 is shown in Table 2-2. The region surrounding the CCNPP site is predominately rural in character. However, since 1970, open space in Calvert County has been converted to residential use at an average rate of nearly 400 ha (1000 acres) per year. The amount of farmland in the County declined from approximately 25,000 ha (63,000 acres) in 1970 to approximately 15,000 ha (37,000 acres) in 1992. Commercial, industrial, institutional, and utility development accounts for less than 5 percent of land use in the County.

The Coastal Zone Management Act (CZMA) requires that applicants for a Federal license to conduct an activity in the coastal zone shall provide in the application to the licensing agency a certification that the proposed activity complies with the enforceable policies of the State's approved Coastal Zone Management Program and that the activity will be conducted in a manner consistent with the program [33 USC 1456(c)(3)(A) CZMA].

The MDE determined that renewal of the operating licenses for CCNPP is consistent with the Maryland Coastal Zone Management Program established under the CZMA (MDE 1998).

Table 2-2. Land Use in Calvert County in 1993 (Calvert County 1994a)

Land Use	Hectares (Acres)		% of Total
farms and forests	35,400	(87,400)	62
parks and open space	1710	(4230)	3
institutions and utilities	1710	(4230)	3
residential	17,100	(42,300)	30
commercial	570	(1410)	1
industrial	570	(1410)	1
Total	57,000	(141,000)	100

2.2.2 Water Use

Cooling water withdrawal from the Chesapeake Bay and groundwater withdrawal for other plant uses, as described previously in Subsection 2.1.3, are regulated by the State of Maryland. CCNPP uses a once-through heat dissipation system that withdraws from and discharges cooling water to the Chesapeake Bay.

Water for plant service, make-up, and domestic uses is withdrawn from five groundwater wells tapping into the Aquia Aquifer. The MDE requires BGE to monitor and report withdrawals from the five production wells. Average daily withdrawal rates for the period of July 1996 to June 1998 was 1.89×10^2 m³/s (392,000 gpd) (BGE 1998b). The current State permit limit for groundwater withdrawals is 2.17×10^2 m³/s (450,000 gpd).

2.2.3 Water Quality

Pursuant to the Federal Water Pollution Control Act (FWPCA) (33 USC 1251), also known as the Clean Water Act (CWA), the water quality of plant effluent discharges is regulated through the National Pollutant Discharge Elimination System (NPDES). The MDE is the State of Maryland agency delegated by the EPA to issue the NPDES discharge permit. The current permit (State Discharge Permit 92-DP-0187) was issued on June 16, 1994, and was scheduled for renewal on June 15, 1999. BGE submitted a timely application for permit renewal and continues to operate within the provisions of the old permit while awaiting issuance of a new permit. The MDE stated that it is unaware of any major issue likely to prevent renewal of this permit. Any new regulations promulgated by EPA or the MDE would be included in future permits and may include development and implementation of Total Maximum Daily Loads.

2.2.4 Air Quality

The Chesapeake Bay and the Atlantic Ocean farther to the east generally give the CCNPP site mild winters and summers. Climatological statistics for Baltimore are generally representative of the climate of the site.

According to the National Oceanic and Atmospheric Administration, typical January daily temperatures range from a minimum of -4.8°C (23.4°F) to a maximum of 4.6°C (40.2°F). July temperatures typically range from a minimum of 19.3°C (66.8°F) to a maximum of 30.7°C (87.2°F). The record minimum and maximum temperatures are -22°C (-7°F) and 41°C (105°F), respectively. Typical morning relative humidities range from a low of about 70 percent in the winter to a high of about 85 percent in the early fall. Afternoon relative humidities are generally about 55 percent. The annual average precipitation is about 104 cm (41 in) and is evenly distributed throughout the year. About one-third of the days have

precipitation totaling 0.03 cm (0.01 in) or more. Winter precipitation is generally associated with synoptic weather systems. The average snowfall is about 51 cm/yr (20 in./yr). Summer precipitation tends to be associated with thunderstorms.

During the summer, the region is generally under the influence of the Bermuda high-pressure system. High-pressure systems are typically associated with low winds and increased potential for air quality problems. Air quality in 1997 in Calvert County was generally rated as moderate using the EPA Pollution Standards Index (that is an indicator of community-wide air quality). A moderate rating means that there should be few or no health effects for the general population. The primary pollutant contributing to the moderate rating was ozone. Ozone is not emitted directly; it is the product of chemical reaction that involves volatile organic compounds (VOCs) and nitrogen oxides (NO_x). There appears to have been a gradual decrease in emissions of VOCs and NO_x in Calvert County during the last 10 years (EPA 1999).

Calvert County is within the Washington, D.C., "serious" nonattainment area for ozone (40 CFR 81.321). However, the ozone air quality monitor in Calvert County did not record any exceedences of the National Ambient Air Quality Standard for ozone in 1996, 1997, or 1998. To the west of Calvert County, Prince Georges and Charles counties are also included in the Washington, D.C., nonattainment area. The EPA ozone standard was exceeded at monitors in each of these counties in 1997 and earlier years. To the north of Calvert County, Anne Arundel County is in the Baltimore "severe" nonattainment area for ozone (40 CFR 81.321). The EPA ozone standard has been exceeded in Anne Arundel County each year since 1993. The ozone monitors in Prince Georges and Anne Arundel counties are located generally in the corridor between Washington, D.C., and Baltimore rather than in the portions of the counties nearest the Calvert Cliffs site. St. Mary's County south of Calvert County and the counties across Chesapeake Bay to the east are designated "Unclassifiable/Attainment" areas for ozone (40 CFR 81.321).

The State of Maryland has adopted a State Implementation Plan for that portion of Maryland that is within the boundaries of the Washington, D.C., "serious" nonattainment area for ozone. This plan, which is based upon a plan developed by the Metropolitan Washington Council of Governments, has been approved by the EPA (62 FR 49611). Recent revisions to the plan to achieve an additional 15-percent reduction in emissions of VOCs using reasonably available control technology (RACT) have also been approved by EPA (63 FR 36578). The CCNPP emergency diesel generators (EDGs) are considered major sources of both VOCs and NO_x because of their potential annual release rates (BGE 1998). Permits have been obtained from the MDE for the EDGs.

Calvert County is classified as "Better than National Standards" or "Unclassifiable/Attainment" for the remaining criteria pollutants (40 CFR 81.321). The counties surrounding Calvert County have similar designations for the remaining criteria pollutants except for Anne Arundel County, which does not meet secondary standards for total suspended particulates (40 CFR 81.321). CCNPP is more than 100 km

- | (62 mi) from the nearest Class I area for the Prevention of Significant Deterioration of Air Quality
- | designated in the Clean Air Act (CAA) (42 USC 7401).

2.2.5 Aquatic Resources

- | The area of the Chesapeake Bay in the vicinity of the CCNPP is used for a variety of purposes, including navigation, recreation, and commercial fisheries. Boating and sportfishing are popular. The Bay supports a variety of aquatic species typical of a warm-water partially mixed estuary, including phytoplankton, zooplankton, epibenthic, intertidal, and subtidal communities, as well as commercially and recreationally important finfish and shellfish. Three representative important species (RIS) identified by the State of Maryland include the eastern oyster, *Crassostrea virginica*, the soft shell clam, *Mya arenaria*, and the blue crab, *Callinectes sapidus*. Oyster breeding and nursery areas occur near the plant, and new beds were created during plant construction to mitigate habitat loss (Abbe 1988, 1992). Softshell clams are also present in the intertidal areas surrounding the plant, but have not
- | occurred in sufficient number for commercial fishery since at least before 1971 (Heck 1987).

Blue crab are often caught by commercial and recreational fishers and represent a sizable proportion of the fishing industry. Although mating occurs in the areas near CCNPP, the females typically migrate down-Bay to a spawning and hatching area approximately 110 km (70 mi) south of CCNPP, where an appropriate salinity of approximately 23 to 28 parts per thousand occurs (Sandoz and Rogers 1944). Other recreationally and commercially important species are presented in Table 2-3, in approximate order of abundance. The finfish presented in this table commonly occur in the vicinity of the CCNPP and spend at least part of their life cycle in these waters.

- | Two Federally protected species, the shortnose sturgeon and the Atlantic loggerhead turtle, are known to occur in the vicinity of CCNPP. These are also protected under State of Maryland laws. The general
 - | location and habitat of these species are shown in Table 2-4. BGE researchers caught one shortnose
 - | sturgeon during trawl studies in the vicinity of the CCNPP in 1979 (Heck 1987). However, dam
 - | construction has constrained the distribution of most shortnose sturgeon populations to deepwater
 - | pools from summer through winter. Adults move upstream to spawn during the spring. The ancestral
 - | range of this species is believed to extend from the St. John River in New Brunswick, Canada, to the St. Johns River in Florida. Most populations are considered anadromous, with adults typically living in the ocean and entering freshwater systems to spawn.
- | Freshwater resources associated with CCNPP include approximately 80 ha (200 acres) of marshlands
 - | (AEC 1973), a small man-made wetland created as a mitigation project, several ponds in the vicinity of
 - | Camp Conoy, and several small interior streams. The Maryland Natural Heritage Program lists species
 - | that are rare-to-uncommon in Maryland (occurrences typically in the range of 21 to 100) as S3 species,
 - | although they are not actively tracked by the Heritage & Biodiversity Conservation Programs. A State-
 - | ranked S3 aquatic plant species, the humped bladderwort, *Utricularia gibba*, is found in the littoral zone
 - | of a Camp Conoy pond.

2.2.6 Terrestrial Resources

The CCNPP and its associated transmission corridors lie within the oak-pine-hickory association of the eastern deciduous forest (Greller 1988). These mature forested habitat spp. are dominated by oaks, *Quercus* spp. and hickory, *Carya* spp., as the successional dominants, along with several species of pine, *Pinus* spp.

In 1998, BGE conducted a survey of the natural plant communities at the site and within its associated transmission corridors. These habitats include eight plant community types: agricultural land, managed rights-of-way, chestnut oak association, forested wetlands, open water and emergent wetlands, Virginia pine association, tulip poplar/sweetgum association, and old fields. The latter includes all disturbed areas without an actively managed vegetation cover.

Table 2-3. Recreationally or Commercially Important Aquatic Species Near CCNPP in Order of Abundance

Scientific Name	Common Name
<i>Callinectes sapidus</i>	blue crab
<i>Mya arenaria</i>	soft shell clam
<i>Crassostrea virginica</i>	eastern oyster
<i>Leiostomus xanthurus</i>	spot
<i>Anchoa mitchilli</i>	bay anchovy
<i>Micropogonias undulatus</i>	croaker
<i>Morone americana</i>	white perch
<i>Pseudopleuronectes americanus</i>	winter flounder
<i>Trinectes maculatus</i>	hogchoker
<i>Brevoortia tyrannus</i>	Atlantic menhaden
<i>Morone saxatilis</i>	striped bass
<i>Bairdiella chrysura</i>	silver perch
<i>Microgadus tomcod</i>	Atlantic tomcod
<i>Alosa pseudoharengus</i>	alewife
<i>Clupea harengus</i>	Atlantic herring
<i>Alosa aestivalis</i>	blueback herring

Source: Heck (1987).

Table 2-4. Protected and "Watched" Aquatic Species on and in the Vicinity of the CCNPP Site

Species	Common Name	Federal Status	State Status	Location and Habitat
<i>Acipenser brevirostrum</i>	shortnose sturgeon	Endangered	S1 (highly rare)	Nearshore environment in Chesapeake Bay
<i>Caretta caretta</i>	Atlantic loggerhead turtle	Threatened	S1 (highly rare)	Chesapeake Bay
<i>Utricularia gibba</i>	humped bladderwort	None	S3 (Watch List)	Littoral zone of Camp Conoy Pond

Source: Derived from FWS (1998) and NMFS (1998) and The Natural Heritage Network (1999).

Virginia pine, *Pinus virginiana*, is common on power line rights-of-way. Other trees include chestnut oak, *Quercus prinus*, black gum, *Nyssa sylvatica*, sweetgum, *Liquidambar styraciflua*, tulip poplar, *Liriodendron tulipifera*, sassafras, *Sassafras albidum*, and American beech, *Fagus grandifolia*. The understory includes a variety of herbs and shrubs, including rhododendron, *Rhododendron* spp.

In 1985 and 1987, BGE foresters developed Forest Resource Management Plans for the CCNPP area in consultation with the Maryland Department of Natural Resources. These plans emphasize preservation and maintenance of mature hardwood stands and removal of Virginia pine for disease and fire control. BGE maintains a system of fire roads and fire-fighting tool caches throughout the CCNPP site.

Non-forested, non-industrial habitats include maintained lawns and agricultural fields (corn, wheat, and hay), and disturbed successional habitat. Agriculture has been practiced on the CCNPP site for over 200 years, and BGE retains a forester/land manager to oversee crop production and forest management. BGE continues to preserve those portions of the forest that were not disturbed by construction.

Mammalian fauna of the site and rights-of-way include white-tailed deer, *Odocoileus virginianus*, raccoons, *Procyon lotor*, red and grey fox, *Vulpes fulva* and *Urocyon cinereoargenteus*, eastern gray and fox squirrels, *Sciurus carolinensis* and *niger*, eastern chipmunk, *Tamias striatus*, and a variety of mice and voles. White-tailed deer are the most important game mammal, with eastern cottontail rabbits, *Sylvilagus floridanus*, of secondary importance.

Northern bobwhite, *Colinus virginianus*, and wild turkey, *Meleagris gallopavo*, are the most important game birds in the site vicinity. Bobwhites are associated with the agricultural fields and forest edges,

while turkeys use the forested habitats, rights-of-way, and old fields. The open water and emergent wetland habitat supports a number of migrant waterfowl, and osprey, *Pandion haliaetus*, use the forested areas near the Chesapeake Bay shoreline.

As part of its Forest Resource Management Plans, BGE uses late summer mowing to maintain roads and log loading decks as wildlife food plots and wild turkey brooding habitat. In 1987, the State of Maryland developed a Wildlife Management Plan for the CCNPP site, stressing management of woodlands for wild turkey, and management of fields, road edges, and rights-of-way for wild turkey, bobwhite quail, and eastern cottontail rabbits. BGE updated this plan in 1993 to include additional habitat enhancement projects, including a Tiger Beetle Habitat Protection Area operated under a conservation agreement with The Nature Conservancy, an informative nature trail, osprey nesting and monitoring program, bluebird nest box program, and a wild turkey stocking reservoir. This update also provided for a Calvert Cliffs Wildlife Habitat Committee.

Three Federally protected terrestrial animal species are known to occur on the CCNPP site and rights-of-way. The general location and habitat of these species are shown in Table 2-5. These species are also protected under State of Maryland laws. Two species of concern to the Maryland Natural Heritage Program have been identified on the CCNPP site. These are the spurred-butterfly pea, *Centrosema virginianum*, a State rare species and the pink milkwort, *Polygala incarnata*, a State watch list species. State rare species are considered to be imperiled in Maryland because of rarity, and watch list species are considered rare to uncommon, but otherwise have no specific protection. Older records suggest that one State endangered species, the blunt-leaved Gerardia, *Agalinis obtusifolia*, might exist on the CCNPP site in appropriate habitats. In 1997, BGE initiated consultation with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) under Section 7 of the Endangered Species Act. FWS concurred with the listing BGE provided of threatened or endangered species.

2.2.7 Radiological Impacts

Since 1970, BGE has conducted a radiological environmental monitoring program (REMP) around CCNPP. The radiological impacts to workers, the public, and the environment have been carefully monitored, documented, and compared to the appropriate standards. The purposes of the REMF are to

- verify that radioactive materials and ambient radiation levels attributable to plant operation are within the limits contained in the ODCM and the Environmental Radiation Protection standards as stated in 40 CFR Part 190, *Environmental Radiation Protection Standards for Nuclear Power Operations*

Table 2-5. Protected and "Watched" Terrestrial Species on CCNPP Site and Rights-of-Way

Species	Common Name	Federal Status	State Status	Location and Habitat
<i>Cicindella puritana</i>	Puritan tiger beetle	Threatened	Endangered	Beach area at base of cliffs
<i>Cicindela dorsalis dorsalis</i>	northeastern beach tiger beetle	Threatened	Endangered	Beach area at base of cliffs
<i>Haliaeetus leucocephalus</i>	bald eagle	Threatened	Endangered	Active nest in the vicinity of Camp Conoy; 7 offspring fledged since 1986
<i>Centrosema virginianum</i>	spurred butterflypea	None	Rare	Along a fire road south of St. John's Creek
<i>Polygala incarnata</i>	pink milkwort	None	Watch List	Along old field community roadways

Source: Derived from BGE (1998a) and MDNR (1999).

- detect any measurable buildup of long-lived radionuclides in the environment
- monitor and evaluate ambient radiation levels
- determine whether any statistically significant increase occurs in the concentration of radionuclides in important pathways.

These releases are summarized in the annual reports titled "Radiological Environmental Monitoring Program Annual Report" and the annual Effluent Release Reports. The limits for all radiological releases are specified in the ODCM, and these limits are designed to meet Federal standards and requirements. The REMP includes monitoring of the aquatic environment (Bay water, aquatic organisms, shoreline sediment), atmospheric environment (air particulates and iodine), terrestrial environment including vegetation, and direct radiation.

A separate radiological environmental monitoring program is in place for the Independent Spent Fuel Storage Installation, which is covered by a separate license.

Review of historical data on releases and the resultant dose calculations revealed that the doses to maximally exposed individuals in the vicinity of CCNPP were fractions of the limits specified in the

Environmental Protection Agency's environmental radiation standards 40 CFR Part 190 as required by 10 CFR 20.1301(d). For 1997, dose calculations were performed using the plant effluent release data, onsite meteorological data, and appropriate pathways identified in the ODCM. The summary results for doses to the maximally exposed individual in 1997, which are representative of the doses from the past 5 years, are given below (BGE 1998b).

A review of whole body and organ doses revealed the following results:

- The maximum thyroid dose to a hypothetical child 1.9 km (1.2 mi) WSW of Calvert Cliffs was 0.00005 mSv/yr (0.005 mrem/yr) via liquid and gaseous pathways. This is <0.01 percent of the 0.75 mSv/yr (75 mrem/yr) limit specified in 40 CFR Part 190.
- The maximum whole body gamma dose to a hypothetical child 1.4 km (0.8 mi) WSW of Calvert Cliffs was 0.00009 mSv/yr (0.009 mrem/yr) via liquid and gaseous pathways. This is <0.01 percent of the 0.25 mSv/yr (25 mrem/yr) limit in 40 CFR Part 190.
- The maximum calculated dose to all other organs (GI-tract) was 0.0024 mSv/yr (0.24 mrem/yr) at 1.4 km (.8 mi) WSW of Calvert Cliffs. Compared to the 0.25 mSv/yr (25 mrem/yr) limit in 40 CFR Part 190, this is about 1 percent of the limit.

The applicant does not anticipate any significant changes to the radioactive effluent releases or exposures from CCNPP operations during the renewal period and, therefore, the impacts to the environment are not expected to change.

2.2.8 Socioeconomic Factors

The staff reviewed the applicant's environmental report, information available in publications from the State of Maryland, the U.S. Bureau of the Census of the U.S. Department of Commerce (DOC), and planning and economic development bodies in Calvert, St. Mary's, and Charles Counties. Several county staff members, local real estate agents/appraisers, and social services providers were interviewed during a July 1998 site visit. The following information describes the economy, population, and communities near CCNPP.

2.2.8.1 Housing

Between 1970 and 1990, total housing units in Calvert County increased from 7932 to 18,974 (Tri-County Council for Southern Maryland 1993). Growth has continued since 1990 at a rapid rate. Approximately 10 percent of the increase may be attributed to the 909 CCNPP employees who live in Calvert County (as of October 1998). As of July 1998, 256 CCNPP employees live in St. Mary's County

and 46 live in Charles County (Table 2-6). Based on the Maryland total employment multiplier^(a) (3.9997) (DOC 1992a), CCNPP may have accounted for 4200 direct and indirect jobs and 40 percent of the housing growth from 1970 to 1990. Between 1980 and 1990, the number of housing units in the Tri-County (Calvert, St. Mary's, and Charles) area increased approximately 43 percent to a total of 81,320 units.

Since 1990, the Calvert County resident population has increased from 51,372 at the 1990 Census to 64,000 in 1995 and about 72,000 in 1998 (Table 2-7). St. Mary's County increased in population from about 76,000 in 1990 to almost 88,000 in 1998. About 6600 housing units were added to the Calvert County housing stock between 1990 and 1996, as the north end of the county became a more popular bedroom community for Washington, D.C., and the Patuxent River Naval Air Station in St. Mary's County added 5200 civilian and military jobs. St. Mary's County added 5100 housing units over the same 1990-1996 period, while Charles County added 6800 units. Housing availability in the Tri-County area is not limited by growth-control measures, although multifamily housing is effectively limited to a handful of town growth centers by water and sewage issues. With a vacancy rate of approximately 7 percent, over 5700 units are available for occupancy (Tri-County Council for Southern Maryland 1993).

2.2.8.2 Public Services

Water Supply

Fresh water used in Calvert County comes from subsurface sources and is used primarily for domestic and agricultural uses. The county has 22 privately owned residential community water systems, 17 municipally owned water systems, and 24 systems owned by corporations or institutions. Some nearby water systems in St. Mary's County draw from and compete with systems in Calvert County. Table 2-8 shows output of selected water supply systems in communities near CCNPP, as well as the estimated population served by each in 1994-1995; Figure 2-8 shows their locations. The normal output of these systems is small, but increases substantially in the summer to accommodate seasonal increases in population.

In Southern Maryland, the majority of the public water supply is drawn from the Aquia Aquifer (Figure 2-9). There are some water supply systems starting to experience supply problems in the southern portion of the Tri-County area, especially in the Solomons Island and Lexington Park areas. These systems both draw water from the Aquia Aquifer with an average daily output of 9.8 L/s

(a) A total employment multiplier is the ratio between total employment associated with an activity and the number of persons directly employed. The ratio is always greater than 1.0 because an economic activity generates employment in related businesses and in the general economy as direct payroll dollars are spent.

(225,000 gpd) and 52.7 L/s (1,203,000 gpd), respectively. As a result of this large demand, the potentiometric surface in this area has dropped more than 9 m (30 ft) in the last 10 years. However, there is 90 m (300 ft) of available drawdown still remaining (MDNR 1993) without exceeding regulatory limits.

Education

In 1990, there were approximately 38,900 students enrolled in schools in the Tri-County area (Tri-County Council for Southern Maryland 1993). By 1997, the enrollment totals for the public schools

Table 2-6. Geographical Distribution of the Residences of CCNPP Employees, October 1998

Place of Residence	Number of Employees
Calvert County	909
St. Mary's County	256
Anne Arundel County	53
Charles County	46
Prince George's County	23
Baltimore County	7
Baltimore City	4
Carroll County	2
Harford	2
Howard	1
Montgomery County	1
Queen Anne's County	1
Out of State	4
Total, BGE Only	1309
Total, Contractor (geographical distribution believed to be similar)	240
Total	1549

Source: BGE (1998c).

Table 2-7. Population Growth in the Calvert, St. Mary's, and Charles County, Maryland (1970-1995)

Calvert County			St. Mary's County		Charles County	
Year	Population	Annual Growth %	Population	Annual Growth %	Population	Annual Growth %
1970	20,682	—	47,388	—	47,678	—
1980	34,638	5.3	59,895	2.4	72,751	4.3
1990	51,372	4.0	75,974	2.4	101,154	3.4
1995	64,359	4.6	80,783	1.2	111,320	1.9
1998	71,877	3.8	87,670	2.8	117,963	2.0

Sources: Maryland Office of Planning, 1998a, 1998b, 1998c, 1999.

had increased to 14,480 in Calvert County, 21,000 in Charles County, and 14,220 in St. Mary's County, for a total of 49,700. In Charles County, there are 18 public elementary, 6 middle/combined schools, 5 high schools, and 17 private schools. St. Mary's County has 16 public elementary schools, 4 middle schools, 3 high schools, and 8 private schools. Calvert County has 11 public elementary schools, 4 middle schools, 3 high schools, and 10 private schools. Each county has some post-secondary institutions.

A branch of the Charles Community College is located in Calvert County, and the Calvert Career Center is located in Prince Frederick. Off-campus courses from the George Washington University and University of Maryland are offered in Charles County, the Charles Community College (enrollment of 6100) is located in La Plata, and the Career and Technology Center is located in Pomfret. A branch of Charles Community College, and the Southern Maryland Higher Education Center, which provides distance learning through several universities, are located in St. Mary's County; St. Mary's College of Maryland (enrollment of 1650) is also located in St. Mary's County in St. Mary's City.

Calvert County has comparatively low student-teacher ratios, despite having relatively low property taxes. For 1996-1997, student/staff ratios were 15.9 in Calvert County, 13.8 in St. Mary's County, and 15.2 in Charles County. Property tax rates in fiscal year 1998 were \$2.23/\$1000 in Calvert County, \$2.08/\$1000 in St. Mary's County, and \$2.44/\$1000 in Charles County. Given the rapid growth in Calvert County, enrollment is expected to reach 17,000 by the year 2000. Consequently, the fiscal year 1998 capital improvement budget includes several construction projects that are under way, including the construction of two new schools (Windy Hill and South Central) before 2000. St. Mary's County is meeting its needs by renovating and expanding existing schools rather than building new ones. As of July 1998, additions to Chopticon and Leonardtown High Schools, Esperanza Middle School, and Lexington Park, Banneker, and Leonardtown Elementary Schools were underway, with additions to Margaret Brent Middle School in the planning phase.

Table 2-8. Projected Pumpages by Sanitary District/Planning Area from the Aquia and Piney Point-Nanjemoy Aquifers Based on St. Mary's and Calvert Counties' Population Growth Estimates

		1995			2020			
		Pumpage (1000 gpd) ^a			Pumpage (1000 gpd) ^a			
Sanitary District	Population	Total (Aquia and Piney Point)	Aquia	Piney Point-Nanjemoy	Population	Total (Aquia and Piney Point)	Aquia	Piney Point-Nanjemoy
ST. MARY'S COUNTY								
Luckland Run	8788	607	567	40	12,176	1047	997	50
Dukchart's Creek	6017	277.2	237.2	40	7047	354.2	305.2	49
Leonardtown	10,532	598	558	40	13,589	724.6	674.6	50
Flood Creek	2070	198.5	89.5	109	2835	266.1	113.1	135
Piney Point	4008	369.1	149.1	220	5787	463.3	190.3	273
Lake Conoy	1176	444	0	444	1448	551	0	551
Carroll Pond	3529	722	112	610	4347	923.8	141.8	782
Pine Hill Run	37,639	4398.3	2541.1	1857.2	50,183	5702	3328.5	2373.5
Manor Run	4032	135	95	40	5508	175	125	50
Indian Creek	8235	422.1	382.1	40	12,419	647.9	597.9	50
Total	86,026	8171.2	4731.0	3440.2	115,339	10,854.9 (12,973.2)	6491.4 (8663.9)	4363.5 (4309.3)
CALVERT COUNTY								
Planning Area 1	20,870	2256.4	1230	1026.4	39,738	4196.5	2403.7	1792.8
Planning Area 2	15,331	1114.3	808.4	305.9	29,572	1864.6	1357.8	506.5
Planning Area 3	28,197	2325.1	1619.1	706	53,690	3844.5	2662.5	1182
Total	64,598	5695.8	3657.5	2038.3	123,000	9905.3 (11,114)	6424.0 (7655.7)	3481.3 (3458.3)

(a) 1000 gpd = 0.044 L/s.

Source: Achmed and Hansen (1997).

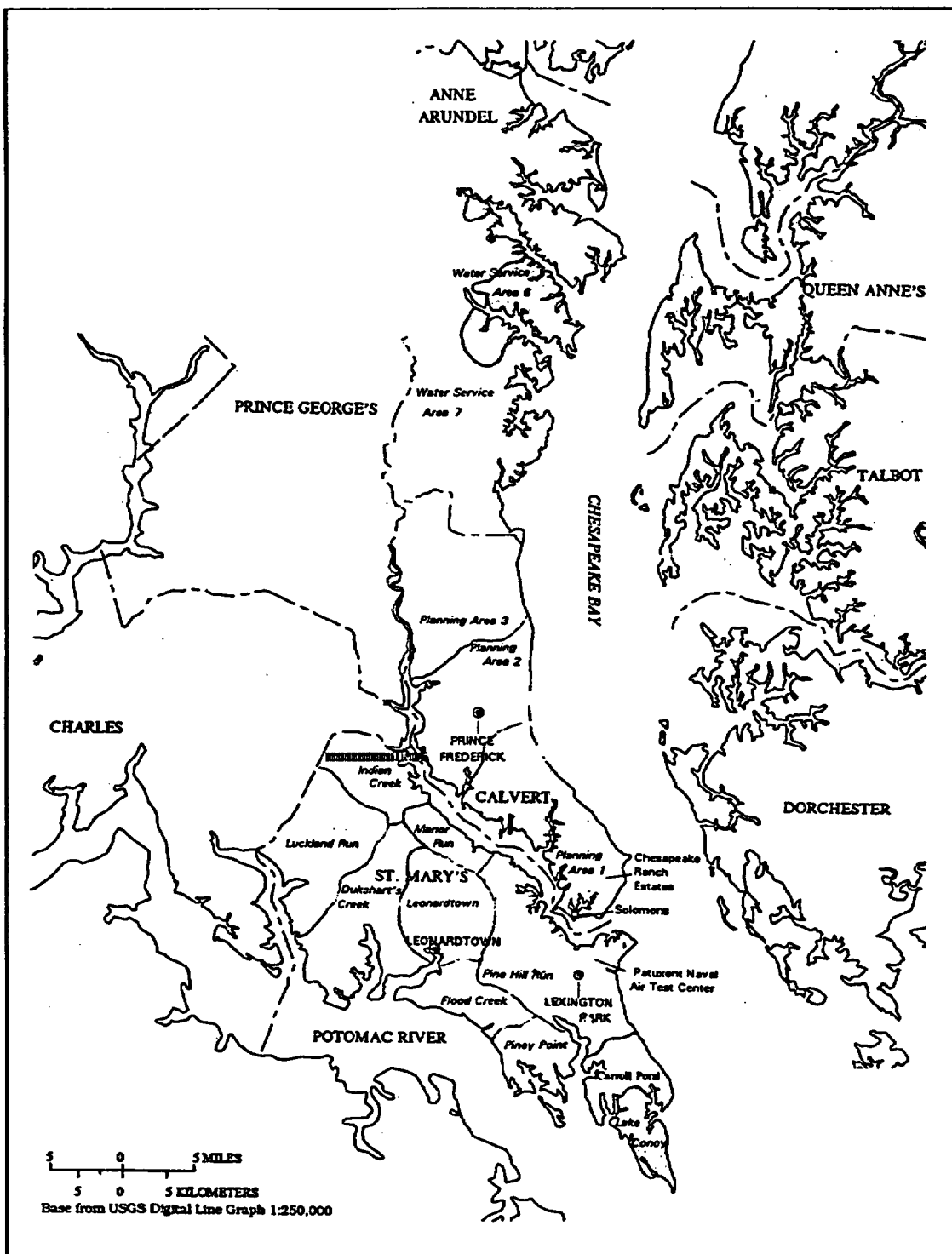


Figure 2-8. Water Supply Systems in Calvert and St. Mary's Counties

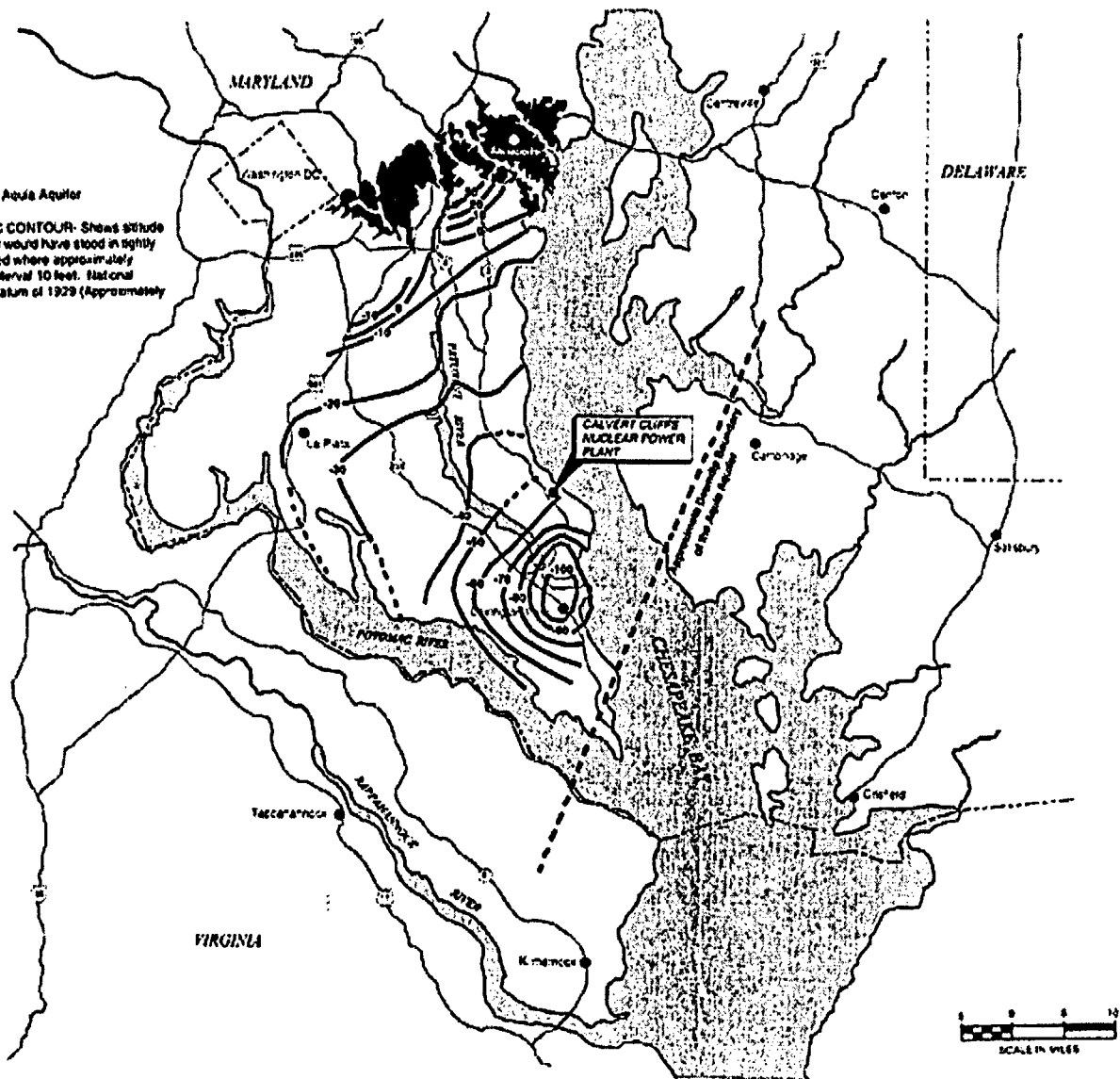


Figure 2-9. Aquia Aquifer Potentiometric Surface Map

Transportation

Calvert County has one main four-lane road (Maryland State Highway 2-4) bisecting the County north to south, with smaller roads running to the water bodies on each side of the peninsula (Figure 2-2.) Very few of the secondary roads connect with each other; therefore, Highway 2-4 services the bulk of the traffic for the length of the County. The highway runs adjacent to the CCNPP site and provides the only access to the site. The highway is considered to meet Service Level D (high density, stable flow in which speed and freedom to maneuver are restricted—see GEIS Section 3.7.4.2); population growth in the county is expected to increase crowded conditions on the road, particularly at selected intersections (Calvert County 1997b).

Splitting from Highway 2 at Solomons Island, Highway 4 connects the southern end of Calvert County via the Thomas Johnson Bridge with Maryland State Highways 5 and 235 in St. Mary's County. Highways 5 and 235 run the length of St. Mary's County from north to south. Highway 235 serves all of the main gates to the Patuxent River Naval Air Station. Highway 2-4 serves as a commuting route from Calvert County to the Patuxent River Naval Air Station. As a consequence of the rapid growth of the station, traffic tie ups at the intersection of Highway 4 and Highway 235 during the morning rush hour can create a backup to the bridge, a distance of about 6 km (4 mi). There are plans to mitigate the bottleneck at this intersection and perform other traffic upgrades in St. Mary's County to accommodate the new population. Several of the secondary highways in Calvert County along Highway 2-4 (such as Highway 760 from Drum Point to Highway 2-4 at the south end of the county) are also becoming crowded due to population growth and may require additional traffic control measures.

The period from 1998 to 2020 has been projected by the State of Maryland to be one of rapid population growth. Calvert County is projected to be the fastest growing county in the State over that period. At the projected growth rate, the County would approximately double its current population by the end of the license renewal period (Calvert County 1994a). Upgrading most arterial links and main highways is likely to be required to accommodate such growth. The Calvert County Planning Commission (Calvert County 1997b) has identified costs of \$130 million in improvements to maintain adequate service on Highway 2-4 through the year 2030.

2.2.8.3 Offsite Land Use

Figure 2-2 shows the CCNPP location, general land use, and planned uses for land in Calvert County, respectively. While land use in the Tri-County area would be influenced to some degree by changes at CCNPP, this section concentrates on Calvert County because the bulk of residential and commercial development related to the plant workforce is contained in Calvert County and because the largest share of the CCNPP tax base exists in Calvert County. Spending of CCNPP-related taxes can also affect economic development and land use.

The region around CCNPP remains predominantly rural in character, with 62 percent of Calvert County in farms and forests and only 2 percent commercial or industrial (see Table 2-2). However, with

population growth, 8.3 percent of the County's agricultural land was lost to residential and commercial development between 1985 and 1990, as well as 6.8 percent of the County's forested land (Calvert County 1997b). This continued a trend evident since 1970, which has shown a rate of conversion from open space to residential use of about 400 ha (1000 acres) a year. Farmland declined from 25,000 ha (63,000 acres) in 1969 to 15,000 ha (37,000 acres) in 1992 (Calvert County 1988; DOC 1992b).

Since the 1970s, the State of Maryland has allowed Transferable Development Rights (TDRs), where land owners can sell their development rights on the open market. Both the State and the County have been active in purchasing and retiring TDRs to preserve agricultural land and resource preservation areas. The tax base provided by CCNPP was a significant factor in the County's ability to do this.

Calvert County's planning efforts over the last 30 years have been focused on directing growth to suitable locations, promoting selected types of economic growth, and practicing stewardship of the land and Chesapeake Bay. Calvert County has adopted a Comprehensive Plan (Calvert County 1997b) and several land preservation and open space plans to preserve the rural character of the County. These plans include large-lot zoning and the Calvert County Agricultural Preservation Program. The implementation strategy contains four steps:

- (1) Reduce total build-out. In 1995, there were 23,500 dwelling units in the County with a theoretical "build-out" capacity of around 50,000 dwellings (Table 2-9). "Build-out" means the total number of dwellings that could be built in the county under current zoning.
- (2) Reduce residential growth rate, which has averaged around 5 percent per year for the last 20 years.
- (3) Preserve prime farms, forests, historic resources, and sensitive areas. These areas comprise approximately 22,000 ha (54,000 acres). By 1997, about 4900 ha (12,000 acres) of prime farm and forest land had been permanently preserved by the County and an additional 3000 ha (7500 acres) were enrolled in either the State or the County Agricultural Preservation Program (Calvert County 1997b).
- (4) Direct growth to appropriate locations. The 1983 Comprehensive Plan called for creation of Town Centers to avoid scattered strip development along Highway 2-4, to promote business growth by encouraging agglomeration economies, to zone and provide infrastructure for multifamily development (including low-income and elderly housing), to reduce dependence on vehicles, and to reduce growth within agricultural areas (Calvert County 1997b).

By 1997, virtually all new commercial development had been directed to Town Centers in Calvert County. General merchandise sales and commercial real property had grown by over 100 percent and both low-income and elderly housing had been built in Town Centers, which also were attracting high and middle-income families. The 1997 Comprehensive Plan (Calvert County 1997b) continues and expands upon these themes. However, new residential development in the County has been in rural areas on large lots (the County requires a minimum lot size of 5 acres in rural areas); approximately

7300 platted, undeveloped lots remain exempt from most current regulations. Approximately 530 ha (1300 acres) of undeveloped land outside of existing residential communities are zoned R-1 (single-family residential) or R-2 (multifamily residential) and need to be reevaluated.

Several other land use controls in the County limit either total development or help steer development toward appropriate locations. In 1988, the County adopted adequate facilities regulations to ensure that roads and schools could accommodate new growth. In the early 1990s, this ordinance effectively stopped the approval of most new subdivisions until schools could be built. Impact fees are also charged for new construction, including a \$350/year/unit for landfill impact, \$600/unit recreation fee,

Table 2-9. Projected Build-Out in Calvert County Under 1995 Zoning

Zoning Category	Dwelling Units as of 1995		Additional Dwelling Units Permitted			Additional Acres Needed for Development	Total Build-Out Under Current Zoning	
			Base ^(a)	TDR ^(b)	Total			
Town Center 6700 acres	2700	12%	5000	+1000	6000	0	8700	17%
Residential 19,000 acres	8500	36%	9000		9000	0	17,500	34%
Resource Preservation District and Farm Community District 34,000 acres	4000 ^(c)	17%	9800	-2800	7000	7500	11,000	21%
Rural Community District 47,000 acres	8300 ^(d)	35%	4500	+1800	6300	7000	14,600	28%
Total	23,500^(e)	100%	28,300		28,300	14,500	51,800	100%

(a) Base number of dwelling units permitted.

(b) Number of additional units that need to be transferred in order to meet the county's goal of preserving 20,000 acres of prime farm and forest land through the Calvert County Agricultural Preservation Program.

(c) Includes 1200 platted undeveloped lots.

(d) Includes 2400 platted undeveloped lots.

(e) Includes 3600 platted undeveloped lots.

Source: Calvert County 1997b.

and a school impact fee of \$3000/unit for single-family detached housing or \$2000/unit for single-family attached housing. In 1989, the State mandated the establishment of Critical Areas within 305 m (1000 ft) of the County's waterways. Allowable densities in most of this area were reduced to 8.1 ha (20 acres) per dwelling unit. The Maryland Forest Conservation Act, adopted in 1993, helped protect large contiguous forested areas. In 1992, the County adopted mandatory clustering together with the designation of three sub-zoning categories: (1) Farm Communities, (2) Resource Protection Districts, and (3) Rural Communities. The provision required that lots be clustered onto 50 percent of any given parcel within a Rural Community and onto 20 percent of the parcel in the other two types. Design standards were adopted to protect fields, forests, and vistas. Finally, in 1993, a new zoning category called "Employment District" was defined to designate non-retail uses. These uses were required to be adjacent to Town Centers to avoid commercial sprawl.

2.2.8.4 Visual Aesthetics and Noise

From the air, the principal visual features of the CCNPP region are the Chesapeake Bay, the Patuxent River, and the countryside, which is generally wooded. The distance across the Bay in the vicinity of CCNPP is approximately 10 km (6 mi) and the far shore is a dark line on the horizon; the view up- or down-Bay is water to the horizon. From the Bay, the shoreline is wooded with widely spaced small housing developments and marinas. The CCNPP site has a 460-m (1500-ft) wide developed area approximately in the middle of 10 km (6 mi) of undeveloped, wooded shoreline featuring 30-m (100-ft) cliffs. These scenic resources have remained unchanged since CCNPP construction.

Offsite scenic resources inland have changed since CCNPP construction due to population growth. This growth has resulted in housing, commercial, and roadside development supplanting agricultural and wooded areas. However, Maryland Highway 2-4 is a State scenic highway, affording views of gently rolling, wooded countryside with interspersed development and occasional agricultural lands. CCNPP is not visible from Maryland Highway 2-4 due to intervening woods and topography.

Because of setback, woods, and topography, noise from the CCNPP is generally not an issue. The only sounds heard offsite are the plant loudspeakers, which can be heard nearby on the Bay, gunfire from the onsite firing range used by the guards for target practice, and public notification systems for emergencies that are tested periodically. Planting extra trees along the southern boundary of the firing range has mitigated firing range noise and has reduced noise complaints to almost zero.

2.2.8.5 Demography

The Final Environmental Statement (FES), Section II.C (AEC 1973), estimated resident population within 80 km (50 mi) of CCNPP for the years 1970 and 2010. As discussed in Section 3.8.2 of the FES, the projection for the year 2010 was 20 percent higher than the current estimate and is approximately the same as the current estimate for the end of the license renewal period.

Sections 3.8.1 and 3.8.2 of the applicant's ER presented U.S. Census data for 1990 and estimated resident population for each decade through the proposed CCNPP license renewal term (2010, 2020, 2030, and 2040). The 2010 projections represent estimated population near the start of the renewal period for Unit 1 (2014), and the projections for the year 2040 represent populations near the end of the initial renewal term (2036 for Unit 2).

Data for 1990 are based on the 1990 Census of Population (DOC 1991). Projections are based on County population projections provided by State planning agencies in Delaware (Delaware Development Office 1995), Maryland (Maryland Office of Planning 1994), Virginia (Virginia Employment Commission 1993), and Washington, D.C. With the exception of Virginia, agency projections extend through the year 2020 for counties in the 50-mile radius. Agency projections for Virginia extend only to the year 2010. Projections for the remaining years in the renewal term are based on the assumption that the last projected rate of population growth in each county would continue unchanged (i.e., the rate of change from 2010 to 2020 is used as the rate of change from 2020 through 2040 for Delaware, Maryland, and Washington, D.C., and the rate from 2000 to 2010 is used as the rate of change from 2010 to 2040 in Virginia).

Resident Population Within 16 km (10 mi)

The estimated resident population within 16 km (10 mi) of the CCNPP for the years 1990, 2010, 2020, 2030, and 2040 is listed in Tables 2-10 through 2-14. Figure 2-10 illustrates the locations of the sectors identified in these tables.

Between 1970 and 1990, the population within 16 km (10 mi) of CCNPP increased almost 50 percent to approximately 36,000. Current projections indicate that by the year 2010, the population within 16 km (10 mi) will be about 63,000, which is about 5 percent higher than the FES estimate. The higher growth within the 16-km (10-mi) radius is primarily related to rapid population growth in Calvert County, Maryland. Between 1980 and 1990, Calvert County was the fastest growing county in the State. According to agency projections, it is expected to continue to be the fastest growing county in the State through the year 2020 (Calvert County 1994b). Factors stimulating growth in Calvert County include proximity to the Washington, D.C., and Baltimore metropolitan areas (1- to 1.5-hour commute by car), less development and lower taxes than those areas, and less stringent land use, zoning, and development regulations compared with surrounding counties (Calvert County 1994b). Near the end of the initial license renewal term (2040), the population within 16 km (10 mi) of CCNPP is expected to be approximately 124,000.

Resident Population Within 80 km (50 mi)

The estimated resident population distribution within 80 km (50 mi) of CCNPP for the years 1990, 2010, 2020, 2030, and 2040 is shown in Tables 2-15 through 2-19. Figure 2-11 illustrates the locations of the sectors identified in these tables.

Table 2-10. Estimated Population Distribution in 1990 Within 10 mi (16 km) of CCNPP^(a)

Sector ^(b)	0-1 mi	1-2 mi	2-3 mi	3-4 mi	4-5 mi	5-10 mi	10-mi Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	2	2
ENE	0	0	0	0	0	169	169
E	0	0	0	0	0	197	197
ESE	0	0	0	0	0	71	71
SE	2	38	84	130	105	0	359
SSE	52	180	300	420	539	1130	2621
S	58	179	297	410	525	8211	9680
SSW	58	180	279	383	424	6705	8029
SW	59	175	273	331	142	2665	3645
WSW	58	175	264	151	212	2001	2861
W	58	176	236	218	278	1344	2310
WNW	55	170	189	216	278	2254	3162
NW	13	68	80	120	198	2298	2777
NNW	0	0	0	0	0	474	474
Total	413	1341	2002	2379	2701	27,521	36,357

(a) Source: Derived from DOC 1991

(b) Figure 2-10 indicates location of sector.

Table 2-11. Estimated Population Distribution in 2010 Within 10 mi (16 km) of CCNPP^(a)

Sector ^(b)	0-1 mi	1-2 mi	2-3 mi	3-4 mi	4-5 mi	5-10 mi	10-mi Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	2	2
ENE	0	0	0	0	0	179	179
E	0	0	0	0	0	209	209
ESE	0	0	0	0	0	75	75
SE	3	70	155	240	194	0	662
SSE	96	332	554	776	996	1825	4579
S	107	331	548	757	970	14,868	17,581
SSW	107	332	515	708	784	11,022	13,468
SW	109	323	504	612	261	3524	5333
WSW	107	322	488	277	392	2733	4319
W	107	324	435	402	514	2450	4232
WNW	101	313	347	399	514	4167	5841
NW	24	124	147	221	366	4248	5130
NNW	0	0	0	0	0	875	875
Total	761	2471	3693	4392	4991	46,177	62,485

(a) Source: Derived from Maryland Office of Planning 1994.

(b) Figure 2-10 indicates location of sector.

Table 2-12. Estimated Population Distribution in 2020 Within 10 mi (16 km) of CCNPP^(a)

Sector ^(b)	0-1 mi	1-2 mi	2-3 mi	3-4 mi	4-5 mi	5-10 mi	10-mi Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	2	2
ENE	0	0	0	0	0	182	182
E	0	0	0	0	0	213	213
ESE	0	0	0	0	0	76	76
SE	4	90	200	309	250	0	853
SSE	123	429	715	1001	1285	2217	5770
S	138	426	707	977	1250	19,011	22,509
SSW	138	429	664	913	1011	13,502	16,657
SW	140	416	650	789	337	3818	6150
WSW	138	417	629	359	505	3024	5072
W	138	419	562	519	662	3142	5442
WNW	131	404	450	515	662	5374	7536
NW	30	161	190	286	472	5479	6618
NNW	0	0	0	0	0	1129	1129
Total	980	3191	4767	5668	6434	57,169	78,209

(a) Source: Derived from Maryland Office of Planning 1994.

(b) Figure 2-10 indicates location of sector.

Table 2-13. Estimated Population Distribution in 2030 Within 10 mi (16 km) of CCNPP^(a)

Sector ^(b)	0-1 mi	1-2 mi	2-3 mi	3-4 mi	4-5 mi	5-10 mi	10-mi Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	2	2
ENE	0	0	0	0	0	185	185
E	0	0	0	0	0	216	216
ESE	0	0	0	0	0	77	77
SE	6	116	258	399	322	0	1101
SSE	159	553	922	1291	1657	2712	7294
S	178	550	912	1260	1614	24,338	28,852
SSW	178	553	857	1177	1303	16,640	20,708
SW	181	537	839	1017	436	4138	7148
WSW	178	537	811	464	651	3358	5999
W	178	540	725	669	854	4034	7000
WNW	169	521	580	664	854	6929	9717
NW	39	209	245	368	608	7065	8534
NNW	0	0	0	0	0	1456	1456
Total	1266	4116	6149	7309	8299	71,150	98,289

(a) Source: Derived from Maryland Office of Planning 1994.

(b) Figure 2-10 indicates location of sector.

Table 2-14. Estimated Population Distribution in 2040 Within 10 mi (16 km) of CCNPP^(a)

Sector ^(b)	0-1 mi	1-2 mi	2-3 mi	3-4 mi	4-5 mi	5-10 mi	10-mi Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	2	2
ENE	0	0	0	0	0	187	187
E	0	0	0	0	0	219	219
ESE	0	0	0	0	0	79	79
SE	7	150	333	515	416	0	1421
SSE	206	713	1189	1665	2137	3336	9246
S	229	709	1177	1624	2080	31,195	37,014
SSW	229	713	1105	1518	1681	20,622	25,868
SW	233	693	1082	1312	562	4483	8365
WSW	229	693	1046	597	840	3743	7148
W	229	697	935	863	1102	5181	9007
WNW	218	672	748	856	1102	8936	12,532
NW	51	269	317	475	785	9110	11,007
NNW	0	0	0	0	0	1878	1878
Total	1631	5309	7932	9425	10,705	88,971	123,973

(a) Source: Derived from Maryland Office of Planning 1994.

(b) Figure 2-10 indicates location of sector.

Between 1970 and 1990, the population within 80 km (50 mi) of CCNPP increased approximately 30 percent to about 3,086,000 (Table 2-15). Current population projections by Maryland, Virginia, Delaware and the District of Columbia indicate that by the year 2010, the population within 80 km (50 mi) will be approximately 3,718,000 (Table 2-16), which is about 20 percent lower than the FES estimate. This difference may be attributed to the slower than expected growth in the Washington, D.C., metropolitan area. In fact, the FES population estimate of 4,757,810 for the year 2010 is higher than the current population projection of 4,719,000 (Table 2-19) for the year 2040. During the license renewal period, major growth areas within the 80-km (50-mi) radius include Calvert, Charles, and Queen Annes Counties in Maryland, and Stafford County in Virginia.

Table 2-20 lists the age distribution of Calvert County in 1990 and the projected age distribution in 2020 compared to the U.S. population. Given the similarities in percentage distributions in the year 2020, the percentage age distribution for the U.S. population in the year 2030 (approximately the midpoint of the license renewal term) can be used to estimate the age distribution of the population in the region surrounding the plant in the year 2030. Table 2-20 shows the percentage age distribution of the U.S. population, and Table 2-21 shows the estimated age distribution of the population within 16 and 80 km (10 and 50 mi) of CCNPP in 2030. As shown in Table 2-21, the population under the age of 18 is expected to represent approximately 23.7 percent of the total population. The largest group is expected to be composed of individuals aged 18 to 44 years.

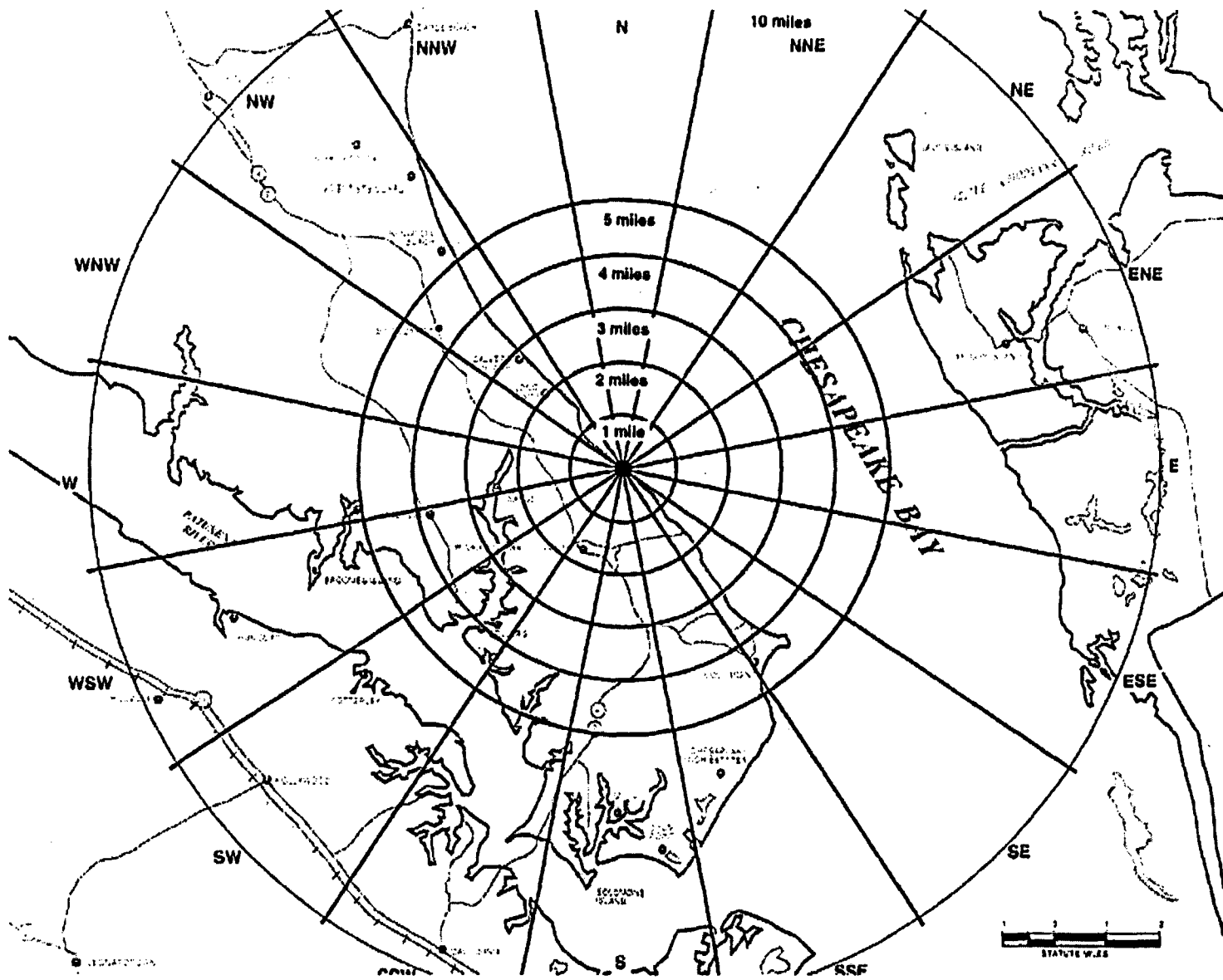


Figure 2-10. CCNPP 16-km (10-mi) Population Sectors

Transient Population

The transient population can be classified as daily or seasonal. Daily transients are associated with places where a large number of people gather regularly, such as local businesses, industrial facilities, and schools. Seasonal transients result from the use of recreational areas such as parks, museums, and marinas in the area. It is estimated that seasonal transients increase the Calvert County population by approximately 23 percent during the summer months (BGE 1992). The daily and seasonal populations associated with selected industry and recreation within 16 km (10 mi) of the station are listed in Table 2-22.

It should be noted that on most weekdays, a significant portion of the resident population is absent from Calvert County during daytime hours. According to the 1990 Census of Population, 57 percent of employed County residents (about 13,000 people) commuted to jobs outside of Calvert County (Calvert County 1997b). With increased numbers of in-movers to the County, the number of commuters was estimated by the State to have increased to 19,250 in 1996 based on the 1990 Census patterns. However, with the large increase in commuter households since 1990, the percentage of commuters may have increased despite increasing commercial development in the County.

2.2.9 Historic and Archaeological Resources

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

2.2.9.1 Cultural Background

The area around the CCNPP site is rich in both prehistoric and historic period resources. This part of southern Maryland has a cultural sequence that extends back to about 10,000 B.C. Aboriginal occupation of the area lasted until the early 1600s when European encroachment pushed the remaining Native American groups from the area. The prehistoric and proto-historic Native American chronology includes three major cultural periods: (1) Paleo-Indian (10,000-7500 B.C.); (2) Archaic (7500-1000 B.C.); and (3) Woodland (1000 B.C.-1600 A.D.) (Pogue and Smolek 1985). Generally speaking, this sequence includes a semi-nomadic existence emphasizing hunting in the earlier timeframe, followed by a shift to more sedentary settlements, more dependent on maize horticulture, along the larger rivers and Chesapeake Bay coastline in Woodland times. Before contact by Europeans in the early 1600s, the region was occupied for several centuries by two Algonkian tribes known as the Nanticokes and the Piscataway. Another tribe, the Susquehannocks, an Iroquoian group from the area that was to become Pennsylvania, moved into the area just before the European contact.

Table 2-15. Estimated Population Distribution in 1990 Within 50 mi (80 km) of CCNPP^(a)

Sector ^(b)	0-10 mi	10-20 mi	20-30 mi	30-40 mi	40-50 mi	50-mi Total
N	0	0	4755	103,099	154,220	262,074
NNE	0	199	9621	24,321	8205	42,346
NE	2	1979	13,694	15,302	12,862	43,839
ENE	169	10,449	19,585	8998	22,817	62,018
E	197	958	1051	6137	60,307	68,650
ESE	71	361	416	26,220	18,838	45,906
SE	359	1	14	663	13,502	14,539
SSE	2621	1266	635	12,844	479	17,845
S	9680	13,864	7475	12,564	13,779	57,362
SSW	8029	13,829	13,962	6458	14,588	56,866
SW	3645	7222	21,808	5836	5243	43,754
WSW	2861	10,129	4757	26,296	6836	50,879
W	2310	10,488	16,982	25,813	42,789	98,382
WNW	3162	7764	41,305	52,317	262,046	366,594
NW	2777	9051	16,050	223,107	1,244,547	1,495,532
NNW	474	13,018	42,692	68,978	234,075	359,237
Total	36,357	100,578	214,802	618,953	2,115,133	3,085,823

(a) Source: Derived from DOC 1991.

(b) Figure 2-11 indicates location of sector.

Table 2-16. Estimated Population Distribution in 2010 Within 50 mi (80 km) of CCNPP^(a)

Sector ^(b)	0-10 mi	10-20 mi	20-30 mi	30-40 mi	40-50 mi	50-mi Total
N	0	0	5684	122,158	180,326	308,168
NNE	0	230	11,147	32,781	11,077	55,235
NE	2	2107	15,865	17,832	15,465	51,271
ENE	179	11,123	20,987	9882	30,274	72,445
E	209	1019	1117	7157	73,078	82,580
ESE	75	383	442	30,930	22,239	54,069
SE	662	1	14	780	15,895	17,352
SSE	4579	1672	839	16,514	550	24,154
S	17,581	18,338	9833	15,510	15,721	76,983
SSW	13,468	18,290	17,830	7144	15,628	72,360
SW	5333	9551	26,877	6813	5432	54,006
WSW	4319	13,396	6804	38,057	8682	71,258
W	4232	13,907	24,538	40,493	66,623	149,793
WNW	5841	12,064	65,890	75,829	361,175	520,799
NW	5130	16,374	22,121	270,772	1,349,440	1,663,837
NNW	875	24,069	55,006	82,903	280,590	443,443
Total	62,485	142,524	284,994	775,555	2,452,195	3,717,753

(a) Sources: Derived from Maryland Office of Planning 1994; Delaware Development Office 1995; Virginia Employment Commission 1993; Washington, D.C. Mayor's Office of Planning 1995.

(b) Figure 2-11 indicates location of sector.

Table 2-17. Estimated Population Distribution in 2020 Within 50 mi (80 km) of CCNPP^(a)

Sector ^(b)	0-10 mi	10-20 mi	20-30 mi	30-40 mi	40-50 mi	50-mi Total
N	0	0	5,954	127,647	187,707	321,308
NNE	0	240	11,650	35,504	11,998	59,392
NE	2	2140	16,580	18,669	16,321	53,712
ENE	182	11,297	21,363	10,142	32,382	75,366
E	213	1035	1134	7505	77,285	87,172
ESE	76	389	449	31,698	22,752	55,364
SE	853	1	15	791	16,123	17,783
SSE	5770	1812	910	17,698	586	26,776
S	22,509	19,870	10,648	16,666	16,689	86,382
SSW	16,657	19,818	19,238	7501	16,156	79,370
SW	6150	10,349	28,988	7282	5522	58,291
WSW	5072	14,516	7594	43,246	9645	80,073
W	5442	15,098	27,491	46,793	76,674	171,498
WNW	7536	14,241	76,286	86,001	405,880	589,944
NW	6618	20,980	25,269	296,136	1,417,969	1,766,972
NNW	1129	31,036	60,761	89,588	302,196	484,710
Total	78,209	162,822	314,330	842,867	2,615,885	4,014,113

(a) Sources: Derived from Maryland Office of Planning 1994; Delaware Development Office 1995; Virginia Employment Commission 1993; Washington, D.C. Mayor's Office of Planning 1995.

(b) Figure 2-11 indicates location of sector.

Table 2-18. Estimated Population Distribution in 2030 Within 50 mi (80 km) of CCNPP^(a)

Sector ^(b)	0-10 mi	10-20 mi	20-30 mi	30-40 mi	40-50 mi	50-mi Total
N	0	0	6240	133,412	195,396	335,048
NNE	0	251	12,177	38,468	13,005	63,901
NE	2	2173	17,329	19,543	17,233	56,280
ENE	185	11,471	21,744	10,412	34,639	78,451
E	216	1051	1150	7871	81,735	92,023
ESE	77	396	456	32,496	23,286	56,711
SE	1101	1	15	802	16,359	18,278
SSE	7294	1964	986	18,976	624	29,844
S	28,852	21,530	11,531	17,909	17,717	97,539
SSW	20,708	21,475	20,757	7878	16,701	87,519
SW	7148	11,215	31,286	7796	5618	63,063
WSW	5999	15,730	8486	49,194	10,725	90,134
W	7000	16,393	30,834	54,070	88,259	196,556
WNW	9717	16,908	88,320	97,604	456,889	669,438
NW	8534	26,906	28,973	323,884	1,491,231	1,879,528
NNW	1456	40,019	67,748	96,854	325,633	531,710
Total	98,289	187,483	348,032	917,169	2,795,050	4,346,023

(a) Sources: Derived from Maryland Office of Planning 1994; Delaware Development Office 1995; Virginia Employment Commission 1993; Washington, D.C. Mayor's Office of Planning 1995.

(b) Figure 2-11 indicates location of sector.

Table 2-19. Estimated Population Distribution in 2040 Within 50 mi (80 km) of CCNPP^(a)

Sector ^(b)	0-10 mi	10-20 mi	20-30 mi	30-40 mi	40-50 mi	50-mi Total
N	0	0	6541	139,462	203,399	349,402
NNE	0	262	12,727	41,700	14,105	68,794
NE	2	2207	18,114	20,461	18,198	58,982
ENE	187	11,649	22,139	10,695	37,053	81,723
E	219	1068	1170	8257	86,445	97,159
ESE	79	402	463	33,323	23,840	58,107
SE	1421	1	15	814	16,596	18,847
SSE	9246	2129	1067	20,357	664	33,463
S	37,014	23,331	12,488	19,250	18,806	110,889
SSW	25,868	23,270	22,403	8275	17,270	97,086
SW	8365	12,152	33,787	8364	5717	68,385
WSW	7148	17,044	9493	56,017	11,942	101,644
W	9007	17,807	34,618	62,487	101,630	225,549
WNW	12,532	20,186	102,258	110,857	515,198	761,031
NW	11,007	34,535	33,353	354,218	1,569,565	2,002,678
NNW	1878	51,603	76,309	104,756	351,064	585,610
Total	123,973	217,646	386,945	999,293	2,991,492	4,719,349

(a) Sources: Derived from Maryland Office of Planning 1994; Delaware Development Office 1995; Virginia Employment Commission 1993; Washington, D.C. Mayor's Office of Planning 1995.

(b) Figure 2-11 indicates location of sector.

Table 2-20. Estimated Age Distribution of Population in 1990 and 2020

Year and Age Group	Calvert County, Maryland		United States	
	Number	Percent	Number	Percent
1990: Under 5	4066 ^(a)	7.9	18,757,000 ^(c)	7.5
5-19	11,854 ^(a)	23.1	52,981,000 ^(c)	21.3
20-44	21,316 ^(a)	41.5	99,731,000 ^(c)	40.1
45-64	9554 ^(a)	18.6	46,169,000 ^(c)	18.6
65 and Over	4582 ^(a)	8.9	31,080 ^(c)	12.5
Total	51,372 ^(a)	100.0	248,718,000 ^(c)	100.0
2020: Under 5	7940 ^(b)	6.5	21,979,000 ^(d)	6.6
5-19	23,130 ^(b)	18.9	64,246,000 ^(d)	19.3
20-44	40,360 ^(b)	32.9	103,844,000 ^(d)	31.2
45-64	32,530 ^(b)	26.6	79,453,000 ^(d)	23.9
65 and Over	18,530 ^(b)	15.1	53,220,000 ^(d)	16.0
Total	122,500 ^(b)	100.0	332,742,000 ^(d)	100.0

(a) U.S. Bureau of the Census Database: C90STFIA.

(b) Maryland Department of Business and Economic Development 1996-1997.

(c) DOC 1995.

(d) DOC 1996.

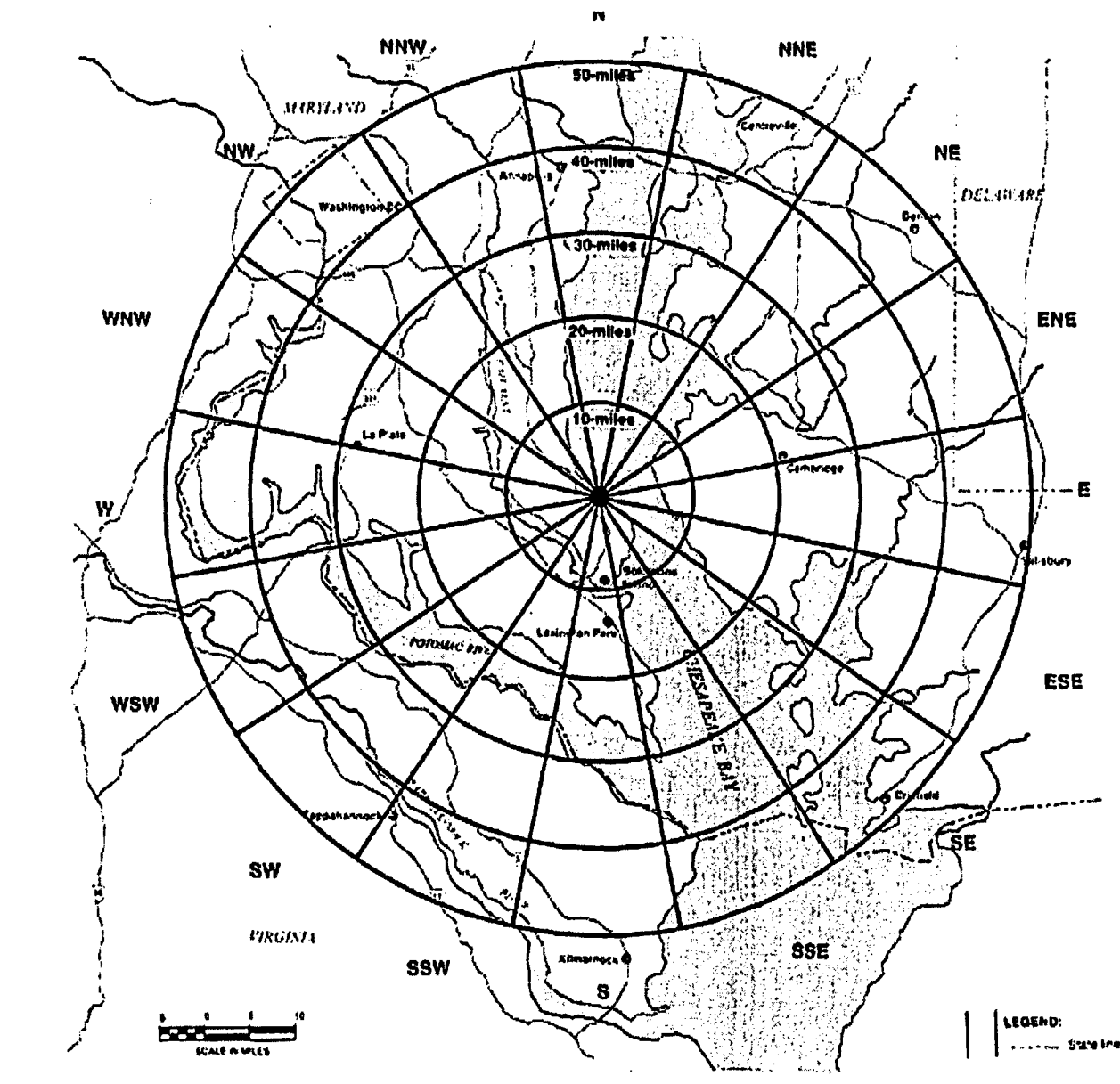


Figure 2-11. CCNPP 80-km (50-mi) Population Sectors

Table 2-21. Projected Age Distribution in 2030 Within 10 mi (16 km) and 50 mi (80 km) of CCNPP

Age Group	Estimated Percentage Age Distribution of U.S. Population	Estimated Population Within 10 mi of CCNPP ^(a)	Estimated Population Within 50 mi of CCNPP ^(a)
Under 5	6.5	6389	282,491
5-17	17.2	16,906	747,516
18-44	34.4	33,811	1,495,032
45-64	21.8	21,427	947,433
65 and Over	20.1	19,756	873,551
Total	100.0	92,289	4,346,023

(a) Total population for the areas within 10 and 50 mi of CCNPP is derived from Tables 2-10 and 2-15, respectively.

Table 2-22. Transient Population Associated with Major Facilities Within 16 km (10 mi) of CCNPP

Family	Location	Population	
		Annual	Daily
Patuxent River Naval Air Station	6-8 mi S and SW	1500	
Chesapeake Bay Biological Laboratory	8-9 mi S		125
Calvert Cliffs State Park	2-4 mi S, SSE, and SE	137,500	
Jefferson Patterson State Park and Museum	5 mi SW	17,560	
Cypress Swamp Sanctuary	9-10 mi WNW	15,510	
Flag Ponds Park	1-2 mi NW	23,750	
Calvert Marine Museum	7-8 mi S	47,960	
Appeal Elementary School	4-5 mi S		820
Patuxent Elementary School	4-5 mi S		880
Mutual Elementary School	6-7 mi WNW		760
Southern Middle School	1-2 mi SSW		740
Our Lady Star of the Sea School	7-8 mi S		140
Town Creek Elementary School	9-10 mi SSW		320
St. John Elementary School	9-10 mi SW		240
Hollywood Elementary School	9-10 mi SW		270
CCNPP Visitors Center	Onsite	29,000	

Reference: Calvert County 1994a; BGE 1992.

Historic European intrusion settlement in the area today known as Calvert County began in the 1620s with visits by fur traders, with the first settlement in the county established in the 1640s. During the later parts of the 1600s and continuing into the 1800s, the economy of Calvert County centered on agriculture, primarily the tobacco crop. Small planters, later supplanted by larger plantations, dominated this agrarian context at first. While other sectors of Maryland were undergoing transitions from agricultural to industrial and rural to urban in the late 1800s and early 1900s, Calvert County remained dependent on tobacco farming (McGrath and McGuire 1992). In the early 1900s and continuing until today, shellfish and tourism were added to the important economic pursuits.

The land on which the CCNPP is located is believed to have been part of an original land grant of 1000 acres in 1658 from Cecilius Calvert, the 2nd Lord Baltimore, to Richard Preston. This grant is commonly referred to as "Preston's Cliffs" or "Charles' Gift." In the mid-1700s, the general area was referred to as "Gideon and Cleverlys Right." By 1782, the acreage where the power plant is located was owned by Andrew Wilson, whose heirs owned the land until 1916, at which time it was sold to Goodman Goldstein. The land was purchased from the Goldstein heirs in May 1967 by BGE to be the site of the CCNPP.

2.2.9.2 Historic and Archaeological Resources at CCNPP

Archaeological

There are no known or recorded prehistoric archaeological sites at CCNPP, although no records could be located to indicate that any field surveys have been undertaken to identify such resources at the 2300-acre plant site. Today, 70 percent of this area remains forested and relatively undisturbed by plant activities. Numerous important archaeological sites occur in proximity to CCNPP (Pogue and Smolek 1985), and it is possible that undetected or buried archaeological sites may be present within the plant area boundary.

Away from the plant, several archaeological field surveys and site evaluations have been completed for BGE transmission line activities, beginning in 1980 (Evans 1980) and subsequently in the early 1990s (Hopkins et al. 1992; Davis and Polglase 1992; Davis et al. 1992; Davis and Simons 1993, and Goodwin and Associates 1993).

Historic

Although a systematic cultural resources field survey of the CCNPP tract has not been performed, several historic period sites have either been recorded or are known to exist. These historic properties include the following (site number designations are from either the Maryland Historical Trust State Historic Sites Survey or the Maryland Archaeological Site Survey):

- (1) CT-58 (Parran's Park) - This historic farmstead included a Maryland Colonial clapboard house, original construction about 1750, that burned in 1955 and other farm outbuildings. Part of an

original tobacco barn, dating to 1840-1860, still exists as part of a reconstructed structure and is used by BGE as a farm and maintenance center as part of the Old Bay Farm operation.

- (2) CT-59 (also designated 18-CV-7) (Preston's Cliffs; Wilson Place) - The remnants of this farm are conspicuous today as the location of the CCNPP Visitors Center and Nature Trail. The farm site consists of the foundation and fireplace chimneys of the house (extant by at least 1691), which was destroyed in 1972 because of its deteriorated condition, a standing log barn (CT-59A), indicated as being the oldest of its kind still standing in the State (being built in 1820), and a modified frame tobacco barn (CT59B) (original construction 1820-1840) that currently serves as the permanent Visitors Center and museum.

CT-59 was first recorded in the State listings as a historic site in 1967 and later as an archaeological site in 1973. Although to date it has not been nominated for the National Register of Historic Places, the property has important historic value and is an important visitation location at the CCNPP site. All three of the structures have been described and recorded, including Historic American Building Survey (HABS) level documentation of the house in 1971 before its demolition (Carson 1974a), including measured drawings and photographs. The house foundation and chimneys were stabilized in 1974 (Rose 1974), and limited archaeological testing was conducted along the foundation in conjunction with the stabilization work (Carson 1974b). Nield (1977) described the log barn structure as part of a survey of historical sites along the BGE transmission corridor, and Stone (1978) discussed the frame tobacco barn. The significance of the frame barn that currently serves as the CCNPP Visitors Center has been apparent as it is shown in a 1936 photograph on file at the HABS office in Washington, D.C.

- (3) CT-154 (Calvert Cliffs Nuclear Power Plant) - The CCNPP has been recorded as a historical property in the Maryland Historical Trust Survey, including a written statement covering its historical and architectural importance.
- (4) Other Sites - Other, as yet unrecorded and unevaluated, historic sites exist on the CCNPP property. Included are standing tobacco barns and Camp Canoy, a currently-used BGE company recreation facility that incorporates an original Boy Scouts of America camp that may have begun to operate as early as the 1930s. Three of about 30 log structures remain from the scout camp era, including two cabins and a larger storage building.

Similar to the situation for prehistoric archaeological sites, archaeological contexts from the historic period have not been fully inventoried nor evaluated. Given the lengthy historic occupation of this area, cultural features such as dumps, privies, and other obscured or buried historic activity areas characteristic of farms may exist on the CCNPP property. Potential impacts to historic sites along the South Circuit transmission corridor were identified and evaluated (Black & Veatch 1992).

National Register of Historic Places and Other Listed Properties

Eight listed historic properties within a 8-km (5-mi) radius of CCNPP are identified in the National Register listing for Calvert County. The closest of these to the plant site are the Middleham Episcopal Chapel (CT-60), located in the Calvert Cliffs State Park south of Lusby, the Cove Point Lighthouse (CT-65), along the Bay coastline southeast of CCNPP, and Morgan Hill Farm, southwest of the plant toward the Patuxent River. The National Register-listed Jefferson Patterson Park and Museum, a Maryland State Museum of History and Archaeology and home to the Maryland Archaeological Conservation Laboratory, is located west of CCNPP, along the Patuxent River.

The Maryland Commission on African American History and Culture maintains an inventory of important sites, structures, and settlements. A review of the listing for Calvert County indicates a number of sites of historic importance to African Americans in the Lusby vicinity, located just southwest of the plant site. Included among these sites are former slave houses and servant's quarters, churches, schools, and settlements. No such properties are indicated as being located within the CCNPP plant site boundary.

2.2.10 Related Federal Project Activities

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

The staff determined that there were no other Federal project activities in the vicinity of CCNPP that could result in cumulative environmental impacts or that would make it desirable for another Federal agency to become a cooperating agency for preparation of the SEIS. No Federal agencies participated in the scoping meetings or submitted written comments during the comment period for the scoping process.

The CCNPP withdraws water from the Aquia Aquifer (see Section 4.5.1). The Patuxent River Naval Air Station located in St. Mary's County is another (and more significant) user of this aquifer. Groundwater withdrawal by the Air Station has environmental effects that are cumulative with the withdrawal for CCNPP. There are numerous other users of the aquifer other than CCNPP and the Naval Air Station. As a result of this large demand, the potentiometric surface in this area has dropped; however, there remains approximately 90 m (300 ft) of drawdown still available. The Maryland Department of Natural Resources (MDNR) monitors the status of the aquifer. The MDE issues permits for groundwater appropriation. BGE holds permits to withdraw groundwater for use at CCNPP and is in compliance with the terms of the permits.

2.3 References

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| 10 CFR Part 20, Appendix B, Table 11, "Annual limits on intake (ALIs) and Derived Air Concentrations (DACs) of radionuclides for occupational exposure; effluent concentrations; concentrations for release to sewerage."

10 CFR Part 50, Appendix I, "Numerical guides for design objectives and limiting conditions for operation to meet the criterion "as low as is reasonably achievable" for radioactive material in light-water-cooled nuclear power reactor effluents."

10 CFR Part 54, "Requirements for renewal of operating licenses for nuclear power plants."

10 CFR Part 61, "Licensing requirements for land disposal of radioactive waste."

10 CFR Part 71, "Packaging and transportation of radioactive material."

40 CFR 81.321, "Designation of areas for air quality planning purposes: Maryland."

40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

| 49 CFR Parts 171 through 177.

| 62 FR 49611, "Approval and Promulgation of Air Quality Implementation Plans; Maryland; 15% Rate of Progress Plan for the Maryland Portion of the Metropolitan Washington, D.C. Area," September 23, 1997.

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3.0 Environmental Impacts of Refurbishment

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.

Table 3-1. Category 1 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE-WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Impacts of refurbishment on surface-water quality	3.4.1
Impacts of refurbishment on surface-water use	3.4.1
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Refurbishment	3.5
GROUNDWATER USE AND QUALITY	
Impacts of refurbishment on groundwater use and quality	3.4.2
LAND USE	
Onsite land use	3.2
HUMAN HEALTH	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
SOCIOECONOMICS	
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

Environmental issues related to refurbishment considered in the GEIS for which generic 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.

Table 3-2. Category 2 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph
TERRESTRIAL RESOURCES		
Refurbishment impacts	3.6	E
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)		
Threatened or endangered species	3.9	E
AIR QUALITY		
Air quality during refurbishment (non-attainment and maintenance areas)	3.3	F
SOCIOECONOMICS		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education	3.7.4.1	I
Offsite land use	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
ENVIRONMENTAL JUSTICE		
Environmental justice	Not addressed	

| The potential environmental effects of refurbishment actions would be identified, and the analysis would
 | be summarized within this section, if such actions were planned. BGE stated that it "has not identified
 | the need to undertake the major refurbishment activities that the GEIS assumed for license renewal,
 | and no other modifications have been identified that would directly affect the environment or plant
 | effluents (BGE 1998 and 1999)." Therefore, refurbishment is not considered in this SEIS.

4.0 Environmental Impacts of Operation

Environmental issues associated with operation during the renewal term were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)*, NUREG-1437 (NRC 1996a). The GEIS included 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 were 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 offsite 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

This chapter addresses those issues related to operation during the renewal term that are listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to CCNPP. Section 4.1 addresses the Category 1 issues applicable to the CCNPP once-through cooling system, while Category 2 issues applicable to the CCNPP cooling system are discussed at greater length in Sections 4.1.1 through 4.1.3. Section 4.2 addresses Category 1 issues related to transmission lines and land use, while Category 2 issues are discussed in Sections 4.2.1 and 4.2.2. Section 4.3 addresses the radiological impacts of normal operation. There are no Category 2 issues related to radiological impacts of normal operation. Section 4.4 addresses the Category 1 issues related to the socioeconomic impacts of normal operation during the renewal term. Category 2 socioeconomic issues are discussed in Section 4.4.1 through 4.4.6. Section 4.5 addresses the Category 1 issues related to groundwater use and quality. Category 2 groundwater use and quality issues are discussed in Section 4.5.1. Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species, a Category 2 issue. Section 4.7 addresses an issue, extremophiles, that was raised by the public during scoping. This issue was determined to be new, but not significant. The results of the

evaluation of environmental issues related to operation during the renewal term are summarized in Section 4.8. Finally, Section 4.9 lists the references for Chapter 4.

4.1 Cooling System

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to CCNPP cooling system operation during the renewal term are listed in Table 4-1. BGE stated in its Environmental Report (ER) that it is unaware of any new and significant information related to these Category 1 issues. No significant new information has been identified by the staff in the review process and in the staff's independent review. 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 GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including reports of studies of the Chesapeake Bay performed for the Maryland Department of Natural Resources (MDNR). Therefore, the staff concludes that there are no impacts of altered current patterns during the renewal term beyond those discussed in the GEIS.
- Altered salinity gradients: Based on information in the GEIS, the Commission found that "Salinity gradients 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including reports of studies of the Chesapeake Bay performed for the MDNR. Therefore, the staff concludes that there are no impacts of altered salinity gradients 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." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its

Table 4-1. Category 1 Issues Applicable to the Operation of the CCNPP Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)	
Altered current patterns at intake and discharge structures	4.2.1.2.1; 4.3.2.2; 4.4.2
Altered salinity gradients	4.2.1.2.2; 4.2.2
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; 4.3.2.2; 4.4.2.2
Water-use conflicts (plants with once-through cooling systems)	4.2.1.3
AQUATIC ECOLOGY (FOR ALL PLANTS)	
Accumulation of contaminants in sediments or biota	4.2.1.2.4; 4.3.3; 4.4.3; 4.4.2.2
Entrainment of phytoplankton and zooplankton	4.2.2.1.1; 4.3.3; 4.4.3
Cold shock	4.2.2.1.5; 4.3.3; 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; 4.3.3; 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	4.2.2.1.11; 4.4.3
HUMAN HEALTH	
Microbial organisms (occupational health)	4.3.6
Noise	4.3.7

evaluation of other available information, including reports of studies of the Chesapeake Bay performed for the Maryland Department of National Resources (MDNR). 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including plant monitoring data and technical reports. 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 significant new information during its independent review of the BGE ER and the site visit, the scoping process, its review of public comments on the draft SEIS, and independent evaluation of available information including the CCNPP National Pollutant Discharge Elimination System (NPDES) permit. 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 significant new information during its independent review of the BGE ER, the NPDES permit for CCNPP, the site visit, scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of discharges of sanitary wastes or 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 significant new information during its independent review of the BGE ER, the NPDES permit for CCNPP, the site visit, scoping process, its review of public comments on the draft SEIS, or its

evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no water-use conflicts 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including monitoring reports and technical reports. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including monitoring reports developed by Academy of Natural Sciences of Philadelphia (ANSP 1980, 1981). 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including monitoring reports developed by ANSP (1980, 1981). Therefore, the staff concludes that there are no impacts of thermal plumes 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including monitoring reports developed by ANSP (Heck 1987) and Martin-Marietta (Holland 1985). 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 and is not expected to be a problem during the license renewal term." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including monitoring studies conducted by ANSP (Heck 1987). 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Staff review of available literature (Heck 1987) and information in the GEIS suggests that the occurrences of periodic episodes of algal blooms, and the recent appearance of the dinoflagellate *Pfisteria piscicida* in the Chesapeake Bay are not attributable to the activities of CCNPP. Therefore, the staff concludes that there are no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.
- Microbial 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of microbial 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 significant new information during its independent

review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of noise during the renewal term beyond those discussed in the GEIS.

Category 2 issues related to cooling system operation during the renewal term that are applicable to CCNPP are discussed in the sections that follow. These issues are listed Table 4-2.

Table 4-2. Category 2 Issues Applicable to the Operation of the CCNPP Cooling System During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR	SEIS
		51.53(c)(3)(ii) subparagraph	Section
Aquatic Ecology (for plants with once-through and cooling pond heat dissipation systems)			
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

4.1.1 Entrainment of Fish and Shellfish in Early Life Stages

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.

The staff reviewed NPDES Permit No. 92-DP-0187 along with a letter from the Maryland Department of the Environment (MDE) stating that the permit holder is currently in compliance with all conditions of the permit (MDE 1998). The staff also evaluated a compilation of BGE and contractor studies of entrainment associated with the cooling water intake. BGE submitted a formal report in 1981 (ANSP 1981) to satisfy the requirements of Section 316 of the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act. This report, along with continuing studies and regulatory evaluations of plant impacts, has supported subsequent renewals of the facility's discharge permit.

The staff's investigation of entrainment issues centered around the following activities: (1) review of the susceptibility of "important" fish and shellfish species to entrainment, (2) the economic value of the species for local or regional commercial fisheries, (3) regional standing stocks of "important" fish and shellfish species potentially affected by plant operation, and (4) transit time from the intake structure to the point of discharge to the Chesapeake Bay. "Important" refers to species that may be commercially or recreationally important, protected by Federal or State law, or may reside in critical habitats. The

staff reviewed these issues to determine the environmental impact of plant license renewal on entrainment of fish and shellfish in early life stages.

Plant-specific studies conducted by BGE personnel and studies conducted by the ANSP provided evidence of how entrainment of fish and shellfish affects the standing populations of the Chesapeake Bay in the vicinity of the CCNPP. Entrainment studies conducted by ANSP and summarized by Horowitz in Heck (1987) led to the following conclusions:

- The species composition of the zooplankton community in the vicinity of Calvert Cliffs is typical of estuaries along the Atlantic and southeastern coast, and the planktonic species were typically entrained in the plant cooling water in densities similar to those of the surrounding waters.
- The five species of zooplankton sufficiently abundant in entrained water to permit statistical study were *Neomysis americana*, *Corophium lacustre*, *Gammarus mucronatus*, *Neanthes (Nereis) succinea*, and *Scolecopelides viridis*. None of these species represent larval or early life stage forms of the representative important species (RIS) identified by the State of Maryland, or commercially or recreationally important species summarized in Table 2-3.
- Transitory exposure of estuarine zooplankton to the elevated temperatures of CCNPP entrainment and discharge plumes was generally non-lethal. Transit time was estimated to be 4 minutes.
- Entrainment survival of the above species was generally high, ranging from 65 to 100 percent.

The conclusions were supported by the results of a study by Newman and Sage (1981), who concluded that the principal effect of entrainment appears to be "cropping," which is defined as a reduction in species density from intake to discharge. Cropping mortality was described as "minimal." Entrained organisms either maintained their structural integrity and survived passage through the plant, or were fragmented from the mechanical and hydraulic shear forces and were lost. Zooplankton survival, defined as the percent of organisms surviving plant passage (number alive at discharge/number alive at intake) were similar to the study described above, with survival ranging from 12 to 100 percent, with a median survival of 55 percent for all species studied.

Anecdotal evidence suggests that mortality is probably due in large part to the mechanical action of passing through the cooling system rather than to short-term exposure to heated water, as laboratory experiments conducted by ANSP suggest a tolerance range for most species above the upper limit set for cooling water. This information also suggests that survival rates were not consistent, but fluctuated hourly, daily, and seasonally.

The results of these studies suggest that the planktonic species entrained did not represent biologically, commercially, or recreationally important species. Entrainment of fish and shellfish in early life stages does not commonly occur, cropping rates are generally low, and survival, while variable, is generally

high. The larvae of the three species that are considered RIS by the State of Maryland: the blue crab, *Callinectes sapidus*; the soft shell clam, *Mya arenaria*; and the eastern oyster, *Crassostrea virginica*; are not susceptible to entrainment by the CCNPP cooling system because the intake is below the zone in which these zooplankton generally occur. It is unlikely that there are management control procedures that would decrease the likelihood of entrainment of zooplankton based on plant design and ecological and hydrodynamic features of this portion of Chesapeake Bay.

The staff has reviewed the available information relative to potential impacts of the cooling water intake system on the site's entrainment of fish and shellfish in early life stages. Based on this review, the staff has concluded that the potential impacts are SMALL, and mitigation is not warranted.

4.1.2 Impingement of Fish and Shellfish

Impingement of fish and shellfish into cooling water systems associated with nuclear power plants is considered a Category 2 issue, requiring a site-specific assessment before license renewal.

The staff reviewed the NPDES Permit, No. 92-DP-0187, along with a letter from the MDE stating that the permit holder is currently in compliance with all conditions of the permit (MDE 1998b). A Federal Water Pollution Control Act (FWPCA) 316(b) demonstration was conducted by the ANSP (1981) using the annual studies conducted in 1977 through 1979. A 316(b) demonstration ensures the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. This information, and subsequent studies and regulatory evaluations of plant operations have supported subsequent renewals of the NPDES permit. Full, annual impingement investigations were conducted during the first 21 years of plant operation

An early impingement study conducted by ANSP (ANSP 1981) determined the number of blue crabs and finfish impinged on the traveling screens at CCNPP, and estimated the value of the loss caused by the impingement based on data from 1977, 1978, and 1979. Impingement studies conducted by ANSP for the years between 1975 to 1983 are compiled and summarized by Horowitz in Heck (1987). The results of these studies form the basis of the decision concerning the effects of impingement on important fish and shellfish populations surrounding the CCNPP. The importance of impingement is determined relative to the recreationally or commercially important species listed in Table 2-3.

During the ANSP (1981) 316(b) demonstration (and for a total of 21 years of continuous impingement monitoring), a collecting net was placed in the screenwash discharge trough through which the impinged individuals travel back to Chesapeake Bay. The sampling schedule was based on repeating 6-day cycles to sample each hour of the day with equal frequency over a 365-day period. On each sampling day, one-hour collections were made at each unit. Since data from earlier impingement survival studies at the CCNPP (see ANSP 1981) had demonstrated greater than 99 percent survival of blue crabs and hogchokers (*Trinectes maculatus*), these species were not included in this study.

Survival data from Burton (1976) were also used to assess potential survival of impinged species and to extrapolate the yearly death toll and subsequent economic loss.

The conclusions of the study for the 3 study years were as follows:

1977: 43,959 finfish and blue crabs were collected during the study.
Yearly impingement estimates were 1,238,991 individuals.
An estimated 219,861 finfish and blue crabs were killed.
Value of killed individuals: \$23,453

1978: 50,359 finfish and blue crabs were collected during the study.
Yearly impingement estimates were 1,576,264 individuals.
An estimated 299,111 finfish and blue crabs were killed.
Value of killed individuals: \$23,274

1979: 67,736 finfish and blue crabs were collected during the study.
Yearly impingement estimates were 1,973,692 individuals.
An estimated 261,785 finfish and blue crabs were killed.
Value of killed individuals: \$26,141

Thus for the 1977 through 1979 time frame, an annual average of 1,600,000 finfish and blue crabs were collected on the traveling screens, of which 260,000 did not survive. The expected monetary loss attributed to the death of finfish and blue crabs due to impingement was \$24,000 per year.

In response to the draft SEIS (February 1999), the MDNR Power Plant Assessment Division provided additional data on the economic evaluation of monetary loss due to impingement at CCNPP (MDNR 1999). In an attachment to the comment letter, MDNR provided summary tables estimating economic losses due to impingement for the years 1993, 1994, and 1995. Table 4.3 is derived from these MDNR tables and summarizes the number of fish and other aquatic species impinged, their survival rate, the total number killed, and the value of the losses. The estimated number of fish impinged as well as the estimated weights were obtained from the ANSP annual impingement studies (Hixon and Breitburg 1993, 1994, 1995). A summary of the information contained in the letter from MDNR to NRC dated May 19, 1999 follows.

Following the methods described above, no value was estimated for species with survival rates greater than 99 percent after impingement (*Callinectes sapidus* and *Trinectes maculatus*). Because there were no known survival estimates for three species (*Morone americana*, *Morone saxatilis*, and *Cynoscion regalis*), the percent survival data presented in Table 4-3 was estimated to be the mean survival for other species impinged for that year (78 percent for *M. americana* and *M. saxatilis*, 82 percent for *C. regalis*).

The value column identified as being from MDNR expresses a valuation of individual species using the AFS valuation factors (AFS 1992). The last column uses factors established in the Code of Maryland Regulations (COMAR Title 08, COMAR Title 26) and an inflated dollar value (1993-1995) based on the Consumer Price Index (CPI). When the COMAR value varied with the size of the fish, an estimate of likely mean size was developed by comparing the approximate weight per fish (from estimated weight and number of fish of each species per unit per year) to known size-weight relationships. The MD NR believes that the assumptions in this valuation are conservative, thereby potentially overestimating the value of fish killed each year.

Comparison of the 1993-1995 valuation with the 1977-1979 estimates contained in the draft SEIS suggest that the draft SEIS may have overestimated the monetary value of impingement losses. The average monetary loss for the years 1977-1979 was \$24,289; average losses presented in Table 4-3 (1993-1995) were \$5746 and \$8599, respectively. It is probable that management actions to decrease impingement (described in later portions of this SEIS) contributed to the decrease in monetary losses associated with this phenomena.

Additional impingement studies conducted by ANSP and summarized by Horowitz in Heck (1987) were performed by collecting fish and shellfish in a nylon net placed in the screen wash discharge troughs of the CCNPP. One-hour collections were made on randomly selected days during three 8-hour periods in 1975. The format became more structured after that and continued for 21 years. Experimental designs changed periodically in response to plant expansion to two online reactors, changes to the curtain wall surrounding the intake, and alterations to the traveling screens. During each study, numbers, species, weight, size, and physical condition of impinged individuals were noted. Sublethal effects, such as loss of equilibrium, were also noted, where appropriate. Estimates of variance in survival rate were calculated for species in which greater than 300 individuals were collected. The number of potential episodes of impingement was estimated based on the number of fish or shellfish impinged per screen per hour. Impingement episodes at the species level were also compared to trawl data to determine if the species impinged on the traveling screens were indicative of the local population distribution, or whether CCNPP was selectively removing certain susceptible species.

The results of the studies indicated that the impinged subset did not show the same degree of dominance and consistency in rank abundance as the trawl samples. This probably was reflective of a high variation in the rate of impingement. Much of the total impingement in a month or year occurred in occasional large impingement episodes of schools of one or only a few species. This suggests an episodic nature to impingement, not a constant removal of individuals over time. The particular schooling species varied with the season, environmental conditions, etc., leading to a greater variation

Table 4-3. Summary of 1993-1995 Fish Losses Through Impingement

Species	No. Fish Impinged	% Survival	Total Fish Killed	Value of Fish Killed (MDNR Est.)	Value of Fish Killed (COMAR Est.)
1993					
Anchoa mitchilli	416,212	0.68	133,187.8	10,655.03	268.71
Brevoortia tyrannus	9165	0.52	4399.2	197.94	1183.38
Callinectes sapidus	659,220	0.99	NE*	—	—
Gobiesox strumosus	2712	0.93	189.8	15.19	0.38
Leiostomus xanthurus	8674	0.84	1388.3	5.19	448.15
Menidia spp.	18,915	0.54	8700.9	696.07	17.55
Micropogonias undulatus	49,457	0.19	40,060.2	15.82	16,164.28
Syngnathus fuscus	14,215	0.85	2132.3	170.58	4.30
Trinectes maculatus	186,982	0.99	NE	—	—
TOTAL VALUE OF 1993 FISH KILL				11755.62	18086.75
1994					
Alosa aestivalis	36,486	0.47	19,549.6	88.81	5376.13
Anchoa mitchilli	21,355	0.68	6833.6	546.69	14.09
Callinectes sapidus	547,626	0.99	NE	—	—
Gasterosteus aculeatus	3606	0.91	324.5	25.96	0.67
Leiostomus xanthurus	10,122	0.84	1619.5	28.43	534.44
Menidia spp.	14,450	0.54	6647.0	531.76	13.79
Morone americana	2463	0.78	532.6	3.93	219.71
Morone saxatilis	1770	0.78	382.8	45.84	789.45
Syngnathus fuscus	7427	0.85	1114.1	89.12	2.30
Trinectes maculatus	39,415	0.99	NE	—	—
TOTAL VALUE OF 1994 FISH KILL				1271.74	6950.50
1995					
Alosa aestivalis	4042	0.47	2142.3	11.62	606.28
Anchoa mitchilli	15,2331	0.58	48,745.9	3899.67	103.46
Callinectes sapidus	1,441,239	0.99	NE	—	—
Cynoscion regalis	5088	0.82	908.6	3.42	542.81
Gobiesox strumosus	3708	0.93	259.6	20.76	0.55
Menidia spp.	13,368	0.84	2138.9	171.11	4.54
Syngnathus fuscus	8611	0.85	1291.7	103.33	2.74
Trinectes maculatus	16,866	0.99	NE	—	—
TOTAL VALUE OF 1995 FISH KILL				4209.91	1360.37
* no estimate					

in the overall catch. The most common species in the impingement samples are listed as follows:

Anchoa mitchilli, the bay anchovy
Leiostomus xanthurus, the spot
Trinectes maculatus, the hogchoker
Brevoortia tyrannus, the Atlantic menhaden
Micropogonias undulatus, the croaker

Although several of the same species were dominant in both impingement and trawl samples, the impingement samples contained greater numbers of hogchokers, menhaden, and other species. Survival studies showed high survival rates for flounders, cyprinodontids, gobies, and blennies. Herring, anchovies, and silversides typically showed intermediate rates of survival, and perciforms showed variable, but generally low survival after coming in contact with the traveling screens.

The blue crab was often impinged on the traveling screens of CCNPP. ANSP has estimated that a total of 5.25 million crabs were impinged on the traveling screens of CCNPP from 1975 to 1982, with annual estimates ranging from 293,000 to over 1.6 million. This correlated well with the annual number of crabs ANSP caught in pots at various locations in the Bay. Experiments showed that impingement survival of blue crabs exceeded 99 percent (Burton 1976), suggesting that impingement probably has little effect on the total population density of crabs in the area of CCNPP.

BGE provided a comprehensive summary of impingement investigations at the CCNPP from 1975-1995 (BGE 1998b). In this report, detailed information is presented that summarizes the number of species and individuals impinged on the traveling screens each year, and estimates mortality based on previous study results. In addition to 21 annual impingement surveys, three studies are discussed: The FWPCA Section 316 Study (ANSP 1981), Ecological Studies in the Middle Reach of the Chesapeake Bay (Horowitz in Heck 1987), and a 1989 Trends reports developed by ANSP. The results of the BGE report suggest that some impingement episodes may occur due to stressful environmental conditions in the Bay caused by natural phenomena. During these stressful conditions, large numbers of finfish may become debilitated and subsequently impinged on the traveling screens. Plant modifications, including curtain wall panel removal at critical times, have enabled fish to escape the intake area and follow an oxygen gradient out of the area. BGE presents the following quote from the 1982-1986 ANSP report that summarizes one of their conclusions concerning impingement:

Most abundant species were impinged in significantly larger numbers during some years than during others. However, peak years of commercial catches and peak years of impingement did not coincide for any of the abundant species for which commercial catch data are available. Instead, large impingements often resulted from fish kills associated with low dissolved oxygen concentrations.

The results of these studies suggest the following:

- Mortality due to impingement is species-dependent: blue crabs, flounders, cyprinodontids, gobies and blennies exhibit high survival after impingement; herring, anchovies, and silversides exhibit intermediate survival; and perciform fish generally do not survive impingement.
- Losses of finfish and blue crabs to impingement represent only about 0.1 percent of commercial landings. If recreational landings of fish and shellfish are included, the impingement losses associated with the CCNPP represent approximately 0.05 percent of the total take from this area of the Chesapeake Bay.
- Management actions to reduce impingement have been ongoing since plant construction and have included modification of the intake curtains (including panel removal during episodes of low dissolved oxygen in intake water), traveling screen configuration, and discharge trough design.
- Yearly economic losses due to impingement, even after conversion to 1998 dollars, appear to be only a very small fraction of the total value of the resource to commercial and recreational entities.
- Excessive impingement events appear to be correlated with stressful environmental conditions that are not attributable to CCNPP operations. Warm weather, a thermally stratified bay, and prolonged west or southwest winds may create low dissolved-oxygen conditions near the plant that debilitate finfish and make impingement more likely.

As described above, the staff has reviewed the available information relative to potential impacts of the cooling water intake system on the impingement of fish and shellfish, and concludes that the potential impacts are SMALL, and mitigation is not warranted.

4.1.3 Heat Shock

The effects of heat shock are listed as a Category 2 issue and require plant-specific evaluation before license renewal.

A copy of the NPDES permit, No. 92-DP-0187, along with a letter from the MDE, affirms that the permit holder is currently in compliance with all conditions of the permit. A 316(a) demonstration (FWPCA) was conducted by the ANSP (1981). This information, and subsequent studies and regulatory evaluations of plant operations, have supported subsequent renewals of the NPDES permit. The staff evaluated the following information:

- a description of the condenser cooling system; its configuration determines which permits must be acquired, and the potential severity of impacts on particular aquatic organisms or systems

Environmental Impacts of Operation

- a temperature-duration-mortality relationship and susceptibility of "important" local species to heat shock
- estimates of the regional standing stocks for those "important" species potentially affected by cooling system discharge operation
- a description of applicable State and Federal (40 CFR Part 423) effluent guidelines and the thermal standards or limitations applicable to the water body to which the discharge is made (including maximum permissible temperature, maximum permissible temperature increase, mixing zones, and maximum rates of increase and decrease), and whether and to what extent these standards or limitations have been approved by the Administrator of the EPA in accordance with the Federal Water Pollution Control Act, as amended.

The potential effects of heat shock associated with the cooling water discharge from the CCNPP can best be determined by understanding the behavior of the thermal plume as it leaves the discharge and enters the Chesapeake Bay. Bay water enters the CCNPP through the intake channel, and transits through the plant in approximately 4 min, with a resulting maximum allowed temperature change (ΔT) of 6.7°C (12°F). After passing through the condensers, the warm effluent is discharged through four 4×4 m (12.5×12.5 ft), concrete conduits (two for each unit) which rest on the bay bottom. Water is discharged along the 3-m (10-ft) depth contour at 2.7 m/s (700 gal/s) from the conduit system, which is located 260 m (850 ft) offshore (Holland et al. 1984).

A number of studies have been conducted to determine plume dimensions and compare the results to the State of Maryland Water Quality Standards (Martin Marietta 1976a, b; ANSP 1980). An overall compilation of studies of plume characteristics may also be found in *Ecological Studies in the Middle Reach of Chesapeake Bay, Lecture Notes on Coastal and Estuarine Studies* (Heck 1987). These studies represent the most complete analyses of the thermal plume associated with the CCNPP activities to date.

Early studies were conducted to determine plume characteristics during one- and two-unit operation, determine relative current speed and direction during tidal cycles via current meters, and determine both near- and far-field effects under varying plant loads. Dye studies were also employed to better understand the dispersive characteristics of the plume. Extensive studies were performed on plume characteristics in 1979, concluding that for a condenser temperature rise of 6.7°C (12°F), the CCNPP full-load plume would comply with all mixing zone requirements for discharges to tidal waters. Further, these studies estimated the area in which the temperature rise exceeded 2°C (3.6°F) at 0.15 km^2 (0.06 mi^2) based on a condenser temperature rise of 6.7°C (12°F). These data suggest that under most conditions, thermal shock is not expected to occur, based on a target organism's ability to withstand episodic temperature changes of 2°C (3.6°F) or less.

Summary information provided in Heck (1987) suggested the following findings concerning the relative effects of the thermal plume associated with cooling water from the CCNPP discharge:

- With a maximum temperature increase of 6.7°C (12°F), 9100 m³ (2.4 million gallons) of water pass through the condensers each minute and transfer a tremendous amount of waste heat into the Bay. However, dilution is great, mixing is rapid, and the thermal plume is confined to a relatively small area.
- The area in which the temperature rise exceeds 2°C (3.6°F) is estimated to be 0.34 km² (0.13 mi²); the area in which the temperature rise exceeds 1°C (1.3°F) is estimated to be 1.00 km² (0.4 mi²).
- Three RIS have been identified that may be influenced by the thermal plume created by the CCNPP: the eastern oyster, the soft-shell clam, and the blue crab.
- The eastern oyster is the most important resource that uses the area near the CCNPP for breeding and as a nursery. Entrainment studies by Olson and Sage (1979) and Newman and Sage (1981) showed no entrainment of oyster larvae in the plume. Once oysters have set, they show increased growth from the elevated temperature near the CCNPP, based on data from planting efforts conducted by MDNR (Abbe 1988, 1992).
- The soft shell clam has not occurred in sufficient numbers near the CCNPP to support commercial harvesting. The low population densities occurred long before plant operation began in 1975 and appear to be related to the physical and hydrodynamic characteristics of the Chesapeake Bay, predation, and other factors.
- There is little thermal impact on juvenile and adult crabs, and essentially no effect on larvae, since they are not found in the area.
- Many finfish are found in the area on a seasonal basis or move through the area during spawning runs, but the commercially and recreationally valuable species such as striped bass, weakfish, bluefish, spot, croaker, flounder, or herring do not spawn in the area. Their larvae, therefore, are not susceptible to thermal effects. Since the area of increased temperature is small, it does not block established migratory fish routes.
- The thermal plume does not support large numbers of overwintering species; therefore, abrupt changes in plant operation are not expected to create adverse conditions for endemic species.

The results of these studies suggest that heat shock and other adverse effects associated with cooling water discharge from the CCNPP present little risk of long-term environmental damage. Pursuant to 10 CFR 51.53(c)(3)(ii)(B), no further assessment of heat shock is required. Therefore, the staff concludes

that potential heat shock impacts resulting from operation of the plant's cooling water discharge system to the aquatic environment or in the vicinity of the site are SMALL, and mitigation is not warranted.

4.2 Transmission Lines

The CCNPP power transmission system is divided into a North and a South Circuit. The land beneath the lines, about 105 km (65 mi) of 100 to 125-m (350- to 400-ft) wide rights-of-way, is owned by BGE. The lines cross mostly second-growth hardwood and pine forests, pasture, and farmland. The plant is connected to the Southern Maryland Electric Cooperative's substation via a 69-kV underground transmission line.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to CCNPP transmission lines are listed in Table 4-4. BGE stated in its ER that it is unaware of any new and significant information related to these Category 1 issues. No significant new information has been identified by the staff in the review process and in the staff's independent review. 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 GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, consultation with MDNR, its review of public comments on the draft SEIS, or its evaluation of other available information. 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.
- Bird collision with power lines: Based on information in the GEIS, the Commission found that "Impacts [of bird collisions with power lines] are expected to be of small significance at all sites." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information, including the status of the BGE monitoring program, BGE efforts to document collisions, and BGE efforts to protect species nesting on the power lines. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 wetland 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, consultation with MDNR, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on floodplains and wetland on power line right-of-way during the renewal term beyond those discussed in the GEIS.

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
TERRESTRIAL RESOURCES	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collisions 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
AIR QUALITY	
Air quality effects of transmission lines	4.5.2
LAND USE	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

- Air quality effects of transmission lines: Based on 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 and 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of restriction on use of power line rights-of-way 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 4-5. They are discussed in Sections 4.2.1 and 4.2.2.

4.2.1 Electromagnetic Fields—Acute Effects

The GEIS analysis for electric shock from transmission lines was unable to reach a conclusion on the significance of the electric shock potential because for earlier licensed plants, electric shock was not addressed, some plants may have chosen to upgrade the voltage line, and land use may have changed. 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 National Electric Safety Code (NESC) for preventing electric shock from induced currents.

In the ER, BGE stated that the South Circuit was designed to be in compliance with the NESC for electrical shock potential. Calculations of steady-state current for the largest vehicle anticipated under the lines result in less than the 5-milliampere (mA) code limit. The North Circuit lines were installed

before the NESC was adopted. However, calculations of steady-state current for the largest vehicle anticipated under the northern lines results in less than the 5-mA code limit. BGE, therefore, concludes (BGE 1998a) that the North Circuit also meets the NESC recommendations for preventing electric shock from induced currents.

Table 4-5. Category 2 Issues Applicable to the CCNPP Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) subparagraph	SEIS Sections
HUMAN HEALTH			
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

Based on the above, the staff concludes that the impact of the potential for electrical shock is **SMALL** and mitigation is not warranted.

4.2.2 Electromagnetic Fields—Chronic Effects

In the GEIS, the chronic effects of electromagnetic fields from power lines were given a finding of "not applicable" rather than a Category 1 or 2 designation 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) includes the following paragraph:

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 51, Subpart A, Appendix B, Table B-1, that are applicable to CCNPP with regard to radiological impacts are listed in Table 4-6. BGE stated in its ER that it is unaware of any new and significant information related to these Category 1 issues. No significant new information has been identified by the staff in the review process and in the staff's independent review. 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 GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-6. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
HUMAN HEALTH	
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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process,

its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Period

Category 1 issues in 10 CFR 51, Subpart A, Appendix B, Table B-1, that are applicable to socioeconomic impacts during the renewal term are listed in Table 4-7. BGE stated in its ER that it is unaware of any new and significant information related to these Category 1 issues. No significant new information has been identified by the staff in the review process and in the staff's independent review. 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 GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-7. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SOCIOECONOMICS	
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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process or public comments on the draft SEIS, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information in its review of the BGE ER or through the site visit, the scoping process or public comments on the draft SEIS, and independent evaluation of available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4-8 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS.^(a)

4.4.1 Housing Impacts During Operations

In determining housing impacts, BGE chose to follow Appendix C of the GEIS, which presents a population characterization method that is based on two factors, "sparseness" and "proximity" (GEIS Section C.1.4). Sparseness measures population density and city size within 32 km (20 mi) of the site, while 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). CCNPP was selected by the NRC to be evaluated as a potential socioeconomic case study site. The results of this evaluation, published in the GEIS, classifies the CCNPP population as "high" (GEIS Table C.2). Using the demographic data given in Section 2.2.8, the population density within a 32-km (20-mi) radius of CCNPP is 42 persons/km² 109 persons/mi²), giving a sparseness Category of 3. The population density within an 80-km (50-mi) radius is 152 persons/km² (393 persons/mi²), giving the site a proximity Category 4. These values combine to give

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

the CCNPP population a category measure of 4.3, within the "high" category, consistent with the GEIS characterization. Moreover, forecasted growth in the region from 1998 to 2040 due to causes other than CCNPP is likely to make the population rating continue to increase.

Table 4-8. Category 2 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) subparagraph	SEIS Section
SOCIOECONOMICS			
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			
Environmental Justice	Not addressed		4.4.6

As described in Section 2.2.8, the Tri-County (Calvert, St. Mary's, and Charles) area around CCNPP is not subject to growth control measures that effectively limit housing development, although Calvert County is attempting to steer the growth toward particular locations to preserve the County's rural character. The County is also buying development rights to some lands to preserve open space. In 10 CFR Part 51, Subpart A, Appendix B, Table B-1, NRC found that impacts to housing are expected to be of small significance at plants located in a "high" population area where growth control measures are not in effect. The applicant states that because CCNPP is located in a high population area and is not located in an area where growth control measures limit housing development, housing impacts are expected to be SMALL.

Small impacts result when no discernable change in housing availability occurs, changes in rental rates and housing values are similar to those occurring statewide, and no housing construction or conversion occurs. Although significant housing impacts are expected in all three counties as a result of population growth, it will be difficult to discern the impact of the additional population that would move to the area as a result of CCNPP operations during the license renewal period. BGE does not expect to hire additional employees for license renewal, but used the bounding estimate in the GEIS of 60 new employees as the basis for analyzing a bounding case scenario. The maximum impact to area housing was calculated by BGE using the following assumptions: (1) all direct and indirect jobs would be filled

by in-migrating residents; (2) the residential distribution of new residents would be similar to the current worker distribution; (3) each new job (direct and indirect) represents one housing unit. As described in Section 2.2.8 of this report, the counties that have the most CCNPP workers are Calvert, St. Mary's, and Charles, which, together, account for approximately 93 percent of CCNPP employees. Were the applicant's maximum impact assumptions to hold true, BGE's bounding estimate of 60 license renewal employees could generate demand for as many as 223 housing units (60 employees Maryland employment multiplier of $3.997 \times 93\%$). However, the 81,000 housing units in the three counties and a vacancy rate of 7 percent (Tri-County Council for Southern Maryland 1993) together give about 5700 units currently available for occupancy. Although it would add a small amount to any future cumulative impact on housing from general population change, a decrease in availability of 4 percent (223 units) is not expected on its own to have a discernable effect on housing availability, rental rates, or housing prices, or to spur housing construction or conversion. The staff reviewed the available information relative to housing impacts. Based on this review, the staff has concluded that the impact on housing during the license renewal period is SMALL, and mitigation is not warranted.

4.4.2 Public Services: Public Utility Impacts During Operations

Impacts on public utility services are considered small if little or no change occurs in the ability of the system to respond to the level of demand and, thus, there is no need to add capital facilities. Impacts are considered moderate if overtaking of capacity occurs during periods of peak demand. Impacts are considered large if existing levels of service (e.g., such as water or sewer services) are substantially degraded and additional capacity is needed to meet ongoing demands for services. The GEIS indicates that, absent any new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies. BGE's analysis of new and existing information on public services showed no reason to expect impacts on public services other than water supply. In view of the expected population increase in the three counties, especially Calvert County, there may be reason to add significant public services and infrastructure other than water supply during the next 40 years. However, only a very small fraction of the increase would be due to the impact of a maximum of 60 additional CCNPP workers on the area's population.

Analysis of impacts to the public water supply system considered both plant demand and plant-related population growth on local groundwater resources. Section 2.2.2 describes the plant's permitted withdrawal rate and the plant's actual use of groundwater from the Aquia Aquifer for process and domestic uses. Section 4.5.1 presents an analysis of groundwater use conflicts.

As described in Section 2.2.8 of this report, the Solomons Island and Lexington Park areas are starting to experience water supply problems. Therefore, BGE focused its water supply analysis on these two areas. The estimate of a maximum of 60 additional plant employees could generate a population increase of up to 643 people in Calvert and St. Mary's Counties (based on 89% the population increase locating in these two counties, a Maryland employment multiplier of 3.997, and an average household size in Maryland of 3.01). To analyze the impact on the water supply situation in Solomons

Island/Lexington Park, only the portion of the population increase expected in those two communities should be considered. The current population distribution of the two counties indicates that about 9 percent of the total population lives in Solomons or Lexington Park communities. (Mitchell and Paperfuse 1994; Calvert County Department of Economic Development 1994). Assuming that the same percentage of plant-related population growth would live in this area, a population increase of about 58 people could be expected in Solomons/Lexington Park as a result of the renewal of the CCNPP operating licenses (9 percent of 643).

The incremental impact to the local water supply systems can be determined by calculating the amount of water that would be needed by these additional residents. The average American uses between 200-300 liters per day (L/d) (50 and 80 gallons per day [gpd]) of water for personal use (Fetter 1988). At this consumption rate, the plant-related population increase would use between 11,000 and 17,600 additional L/d (2900 to 4640 gpd) of water. The Solomons Water Supply system has an average output of 850,000 L/d (225,000 gpd) of water, and the Lexington Park Water Supply system an average output of 4,500,000 L (1,203,000 gal), for a total of approximately 5,300,000 L (1,400,000 gal). An additional 58 residents, drawing an additional 17,600 L/d (4640 gpd), represents less than 1 percent of current daily output. While expected additional population growth in the next 40 years may double the current population of Calvert and St. Mary's Counties and place significantly greater demands on the groundwater resources (perhaps as much as doubling those demands as well), the impact of plant-related population, while contributing a small portion of this cumulative impact, would be an even smaller portion of the future withdrawal rate, requiring no additional capacity. The staff concludes that the impact on water supply is SMALL, and that mitigation is not warranted.

4.4.3 Offsite Land Use During Operations

Land use in the vicinity of a nuclear power plant may change as a result of plant-related population growth. 10 CFR Part 51, Subpart A, Appendix B, Table B-1 notes that significant changes in land use may be associated with population and tax revenue changes resulting from license renewal. However, Section 3.7.5 of the GEIS notes that if the plant-related increase in population is less than 5 percent of the study area's total population and if plant total tax payments are small relative to the community's total revenue, then new 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.

The analysis of offsite land use during the renewal term has two components: population-driven changes in offsite land use, and tax-driven changes in offsite land use. New population-driven changes in land use during the license renewal term would be small because the projected plant-related population increase is expected to be far less than 1 percent of the current population and is not even a significant portion of the projected population increase for the study area. Calvert County, which is expected to experience a plant-related population increase of 502 (based on 69% of the increase in Calvert County alone), would see a less than 1 percent increase in population as a result of license

renewal. Because Calvert County continues to experience high population growth, conversion of agricultural land to residential and commercial uses is likely to continue. However, only a very small fraction (less than 1 percent) of this conversion would be attributable to plant-related population growth.

Calvert County is the principal jurisdiction that receives direct tax revenue as a result CCNPP's presence. Because there are no major refurbishment activities and no new construction as a result of license renewal, no new tax payments are expected that could significantly influence land use in Calvert County. However, continued operation of the plant would provide a significant continuing source of tax revenues to Calvert County. The Final Environmental Statement (FES) related to operations of CCNPP, Section XI.C.1, written by the U.S. Atomic Energy Commission (AEC 1973), estimated that CCNPP would generate \$6.5 million annually in county tax revenues, which in 1973 would have represented more than 50 percent of county tax revenue. Using the gross national product implicit price deflators, this would be equivalent to about \$20.7 million in 1998 dollars. As shown in Table 4-9, BGE actually paid about \$17 million in property taxes to Calvert County in 1994-95, and over \$20 million in 1997-98. This payment represented about 21 percent of the county budget and has a substantial, positive impact on the fiscal condition of Calvert County. The applicant estimates that property tax payments will continue to rise over the license renewal term, reaching approximately \$33 million per year by 2036.

Table 4-9. Calvert County Property Taxes Paid on CCNPP, Selected Years, 1972-1998

Year	County Assessment	County Revenue
1972-73	\$2,736,910	\$75,812
1975-76	\$267,627,440	\$6,824,500
1980-81	\$540,090,510	\$10,801,810
1985-86	\$595,383,600	\$11,669,519
1990-91	\$631,439,790	\$14,081,107
1991-92	\$617,390,610	\$13,767,811
1992-93	\$676,243,340	\$15,080,226
1993-94	\$690,958,680	\$15,408,379
1994-95	\$769,330,630	\$17,156,073
1995-96	\$778,004,610	\$17,439,503
1996-97	\$877,027,270	\$19,557,708
1997-98	\$923,819,910	\$20,601,184

Source: Data supplied by Calvert County Finance Department

The staff has determined that the significance of project-related tax payments are moderate if the payments to a jurisdiction are between 10 and 20 percent of the total tax revenue of the jurisdiction, and large if the percentage is greater than 20 percent (GEIS). If the tax-related revenues are medium to large relative to the jurisdiction's total revenue, tax-driven land-use changes would most likely be moderate if the community has no pre-established patterns of development (i.e., land use plans or controls), or has not provided adequate public services to guide land-use changes in the past (GEIS). The staff defined magnitude of land-use changes as follows:

- **SMALL**—Very little new development and minimal changes to the area's land-use pattern.
- **MODERATE**—Considerable new development and some changes to land-use patterns.
- **LARGE**—Large-scale new development and many changes to land-use patterns.

Using these criteria, CCNPP tax payments, representing around 21 percent of the total Calvert County budget, are of moderate to large significance. The County also has experienced significant population growth and moderate to large land-use changes. The growth is not directly related to the presence of the CCNPP. Other factors such as proximity to Washington, D.C., and Baltimore, Maryland; less development and lower taxes than those areas; and less stringent land-use, zoning, and development regulations, compared to surrounding counties, clearly play a role. The County has well-established patterns of development due to an established comprehensive plan, including actions by the County to protect open space, and has public services in place to support development, which is being directed toward town centers. In combination, these two factors would be expected to result in **SMALL** land-use impacts from CCNPP-related taxes.

Continuation of Calvert County's tax receipts from CCNPP as a result of license renewal has two offsetting effects on offsite land use. On the one hand, the presence of this major industrial taxpayer keeps tax rates below what they otherwise would have to be to fund the County's government, and also provides for a higher level of public infrastructure and services than otherwise would be possible. This enhances the county's attractiveness as a place to live and tends to accelerate the conversion of open space to residential and commercial uses. On the other hand, the availability of CCNPP taxes makes it possible for the County to conduct an aggressive program to preserve open space by buying open-land development rights, which are then retired.

Calvert County also obtains an indirect monetary benefit from the CCNPP tax base, which helps keep property tax rates low and may add slightly to land conversion due to population growth. Due, in part, to the presence of such a large, stable source of tax income, Calvert County enjoys an AAA bond rating, one of the highest ratings of any jurisdiction in the state (League of Women Voters of Calvert County 1994). This bond rating indicates that there is minimal risk that Calvert County will default in its timely payment of interest and principal, and it affords the county lower interest rates on borrowed funds.

License renewal would continue this indirect benefit. Conversely, plant shutdown and the resulting loss of the property tax base could lower the county bond rating.

Based on this review of the issues, the staff concludes that the net impact of plant-related population increases and tax receipts is likely to be SMALL. While the tax receipts are large enough to result in moderate impacts on land use, Calvert County has a well-developed plan for land use that will minimize land conversion in the future. In addition, while the relatively low taxes, good bond rating, and high levels of public service afforded by CCNPP-related tax receipts tend to draw population growth to the County, these same receipts make possible programs that favor open space. Additional mitigation does not appear to be warranted.

4.4.4 Public Services: Transportation Impacts During Operations

On October 4, 1999, 10 CFR 51.53(c)(3)(ii)(J) and 10 CFR Part 51, Subpart A, Appendix B, Table B-1 were revised to clearly state that Public Services: Transportation Impacts During Operations is a Category 2 issue (64 FR 68496). This issue is treated as such in this final SEIS.

There is significant population growth expected in all three counties in the study area by 2036, as was discussed in Section 2.2.8 of this report. However, at most, less than 1 percent of this expected growth will be due directly to increases in employment at CCNPP. It may be argued that the industrial tax base afforded by CCNPP makes the county a more affordable and pleasant place to live and indirectly increases population, but even this indirect impact is likely to be small and difficult to predict. The additional 60 employees that the plant may require during the renewal period are unlikely to add noticeably to the highway burden. Future general population increase likely will degrade highway level of service at some choke points, but the magnitude of impact of CCNPP on this service degradation is likely to be SMALL and does not require mitigation.

4.4.5 Historical and Archaeological Resources

Because the BGE license renewal application (BGE 1998a) covering an additional 20 years of operation of the CCNPP does not include plans for future land disturbances or structural modifications beyond routine maintenance activities at the plant, there would be no identifiable adverse effects to known historic and archaeological resources. Continued operation of the power plant and protection of the natural landscape and vegetation within the site boundaries would have a beneficial effect in that known or undiscovered resources would receive de facto protection for the term of the license renewal period, being located within an undisturbed area with secured access. Similarly, historic resources and buildings would continue to be preserved and interpreted for the public at the CCNPP Visitors Center and Nature Trail area.

Notwithstanding that BGE does not plan future land disturbances or structural modifications beyond routine maintenance at the plant, there is a possibility that undiscovered or unrecorded prehistoric or

historic period archaeological sites remain on the 2300-acre plant site. Accordingly, care should be taken during normal operations or maintenance to ensure that cultural resources are not inadvertently impacted. These activities may include not only operation of the plant itself, but also land management-related actions such as farming, recreation, wildlife habitat enhancement, or maintaining/upgrading access roads throughout the plant site.

The staff concludes that impacts on historical and archaeological resources is SMALL, and mitigation is not needed.

4.4.6 Environmental Justice

Environmental justice refers to a Federal policy under which Federal actions should not result in disproportionately high and adverse environmental impacts on low-income or minority populations. A minority population is defined to exist if the percentage of minorities within the census blocks exceeds the percentage of minorities in the entire State of Maryland by 10 percent, or if the percentage of minorities within the census block is at least 50 percent. For census blocks within the District of Columbia and States of Virginia and Delaware, the percentage of minorities is compared to the percentage of minorities in the respective state. Executive Order 12898 [59 FR 7629] directs Federal executive agencies to consider environmental justice under NEPA, and the Council on Environmental Quality (CEQ) has provided guidance for addressing environmental justice under NEPA (CEQ 1997). Although it is not subject to the executive order, the Commission has voluntarily committed to undertake environmental justice reviews. Specific guidance is provided in Attachment 4 to NRR (Office of Nuclear Reactor Regulation) Office Letter No. 906, Revision 1: *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues* (NRC 1996b).

The scope of the review should include an analysis of impacts on low-income and minority populations, the location and significance of any environmental impacts during operations on those populations that are particularly sensitive, and any additional information pertaining to mitigation. The descriptions to be provided by this review should be of sufficient detail to permit subsequent staff assessment and evaluation of specific impacts, in particular whether these impacts are likely to be disproportionately high and adverse, and to evaluate the significance of such impacts.

Air, land, and water resources within about 80 km (50 mi) of CCNPP were examined. Within that area, there are a few potential environmental impacts that could affect human populations; all of these were considered SMALL. These include:

- groundwater use conflicts
- electric shock
- microbial organisms
- accident scenarios.

To decide whether any of these impacts could be disproportionate, the staff examined the geographic distribution of low-income and minority populations recorded during the 1990 Census (DOC 1991), supplemented by field inquiries to the local planning departments in Calvert, St. Mary's, and Charles Counties, and to social service agencies in the three counties. The staff focused this portion of the review on the geographic areas most likely to experience the impacts discussed above, i.e., the three closest surrounding counties. This area is referred to as the study area.

Generally speaking, minority populations are a small, dispersed, and declining proportion of the study area's population. Figure 4-1 (taken from the 1990 Census [DOC 1991]) shows the geographic distribution of minority populations with the 80 km (50 mi) radius. Figure 4-1 generally shows that minority populations are concentrated in northern Virginia, near Richmond and near Washington, D.C. However, there are three census block groups with higher percentages of minority residents, one in a generally south-south-westerly direction from CCNPP, near Lusby, and the other two slightly to the west-northwest, near Broomes Island, Maryland. Generally, however, minority populations are either well-mixed into the majority population, or concentrations of minority individuals are too small to be caught in the Census detail. This is consistent with the results of field interviews. There is a small low-income, mainly Hispanic, population concentration at Broome's Island in Calvert County and a small concentration of a mixed-race (Piscataway-African American-white) minority group (locally called "Wesorts") near Benedict in St. Mary's County. Low-income populations are well-scattered throughout the three-county area. Some of these individuals are known to be watermen or ex-sharecroppers effectively engaged in subsistence agriculture. Figure 4-2 shows concentrations of low-income population in the Washington, D.C. area, with other, mainly scattered pockets throughout the 50-mile region (DOC 1991). The cross-hatched census blocks show areas where the percentage of households below the poverty level is 10 percent or more greater than the percentage of households below the poverty level in the entire State of Maryland for those census blocks within the State of Maryland. It also includes census blocks where the percentage of households below the poverty level exceeds 50 percent. For census blocks within the District of Columbia and the States of Virginia or Delaware, the percentage of households below the poverty level is compared to the percentage of households below the poverty level in the corresponding state. Low-income housing tends to be concentrated in the Prince Frederick area. St. Mary's County shows concentrations of low-income population in the vicinity of Hillville-Hollywood-Lexington Park area and at Leonardtown. These are also the locations of low-income housing.

The low-income populations in the Lexington Park area might be adversely affected by groundwater conflicts due to population growth; however, the marginal effect of CCNPP on this problem is at most SMALL. Examination of the various environmental pathways by which low-income and minority populations could be disproportionately affected reveals no unusual resource dependencies or practices through which these populations could be disproportionately affected. Specifically, no pathways were found through which fisheries or subsistence agriculture were significantly affected. Therefore, the impact is SMALL, and no special mitigation actions are warranted.

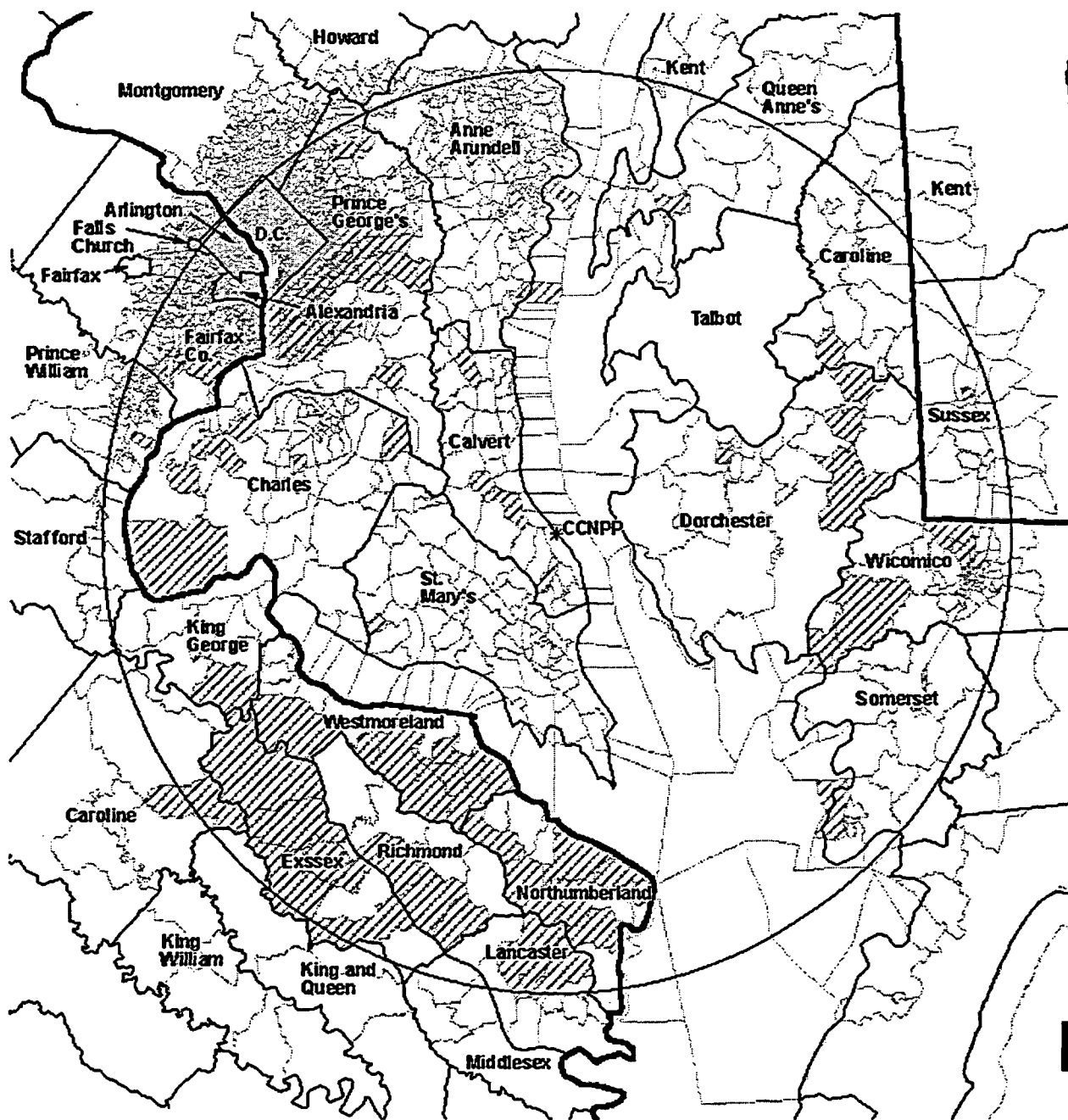


Figure 4-1. Geographic Distribution of Minority Populations (shown in shaded areas)
Within 80 km (50 mi) of the CCNPP

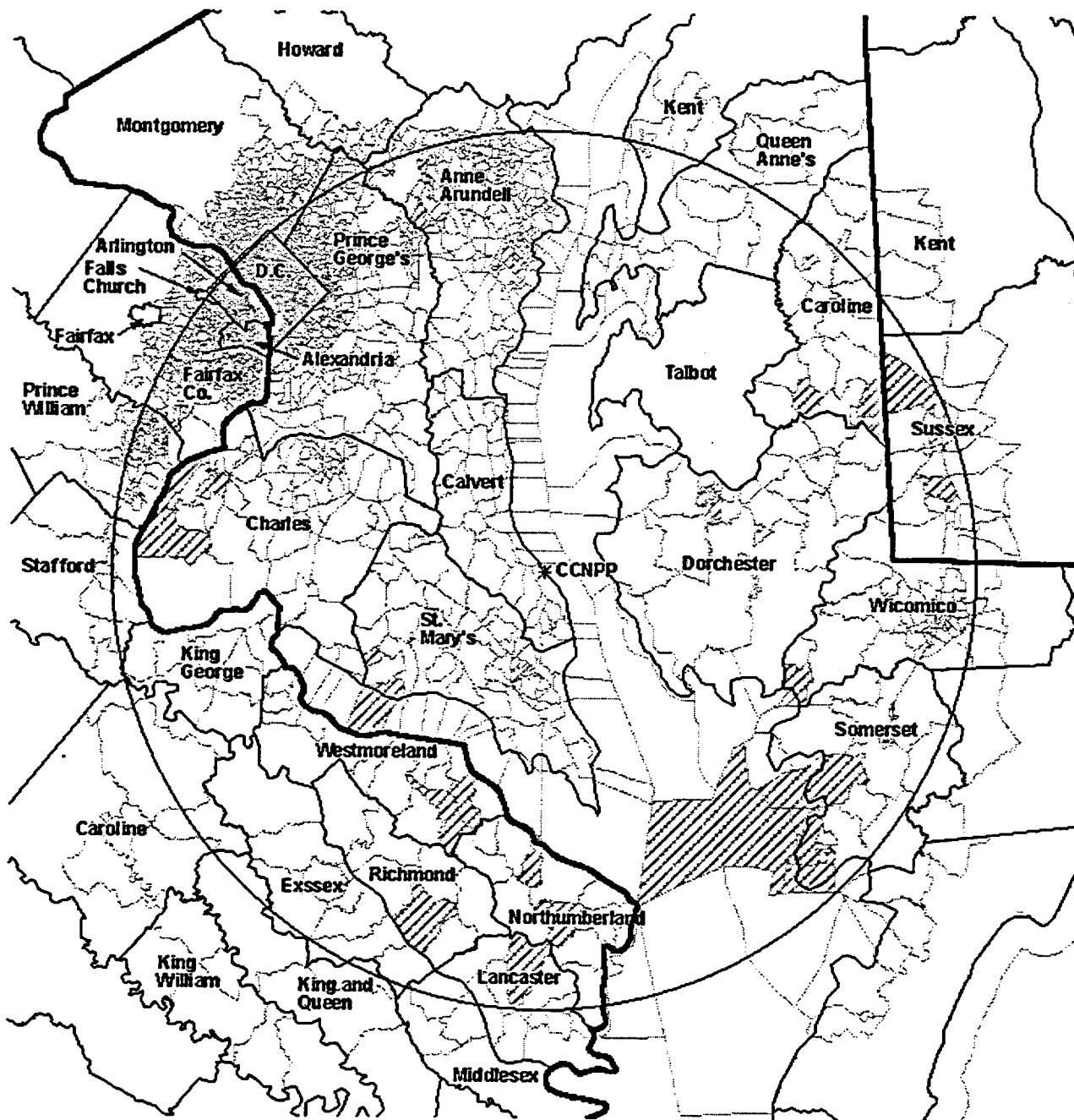


Figure 4-2. Geographic Distribution of Low-Income Populations (shown in shaded areas) Within 80 km (50 mi) of the CCNPP

4.5 Groundwater Use and Quality

A Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, is applicable to CCNPP groundwater use and quality and is listed in Table 4-10. BGE stated in its ER that it is unaware of any new and significant information related to this Category 1 issue. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to this issue beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-10. Category 1 Issues Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
GROUNDWATER USE AND QUALITY	
Ground-water quality degradation (saltwater intrusion)	4.8.2.1

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for the issue follows.

- Ground-water quality degradation (saltwater intrusion): Based on information in the GEIS, the Commission found that "Nuclear power plants do not contribute significantly to saltwater intrusion." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts on groundwater quality from saltwater intrusion during the renewal term beyond those discussed in the GEIS.

There is one Category 2 issue related to groundwater use and quality. That issue is listed in Table 4-11 and discussed in Section 4.5.1.

Table 4-11. Category 2 Issues Applicable to Groundwater Use and Quality During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) subparagraph	SEIS Section
GROUNDWATER USE AND QUALITY			
Ground-water use conflicts (potable and service water, and dewatering; plants that use > 100 gpm)	4.8.1.1; 4.8.2.1	C	4.5.1

4.5.1 Groundwater Use Conflicts (Potable and Service Water)

With both units operating, CCNPP withdraws an average of 0.018 m³/s (284 gpm or 409,000 gpd) (BGE 1998b). This is a Category 2 issue because this flow exceeds the 0.006 m³/s (100 gpm) limit in the GEIS for a Category 1 issue. The groundwater withdrawal is in compliance with a groundwater appropriation permit issued by MDE.

CCNPP withdraws water from the Aquia Aquifer. The drawdown of the water in the Aquia Aquifer in the vicinity of CCNPP is a result of the combined withdrawals of CCNPP and other users. Average withdrawals from the Aquia Aquifer in 1995 were about 0.16 m³/s (3.7 million gpd) in Calvert County and 0.21 m³/s (4.7 million gpd) in St. Mary's County (see Table 2-8).

The U.S. Geological Survey and the MDNR maintain a joint monitoring program of the Aquia Aquifer. The program has tracked and reported on water levels in the Aquia Aquifer since 1975 (Achmad and Hansen 1997). Water levels at a monitoring well located at the CCNPP site have dropped from 4.6 m (15 ft) below mean sea level (MSL) in 1978 to 18 m (60 ft) below MSL in 1994.

In Maryland, water level declines are permitted up to 80 percent of the available drawdown, a distance measured from the estimated prepumping water level to the top of the aquifer. This regulation permits the water level to drop to 109 m (358 ft) below MSL, a far greater depth than has been observed or calculated based on regional growth projections.

The incremental drawdown, based on the maximum permitted withdrawal, resulting from pumpage continuing for the renewal period was estimated to be less than 2 m (5 ft) at 5000 ft from the withdrawal wells. Although continued operation of CCNPP will continue the existing drawdowns caused by the site's groundwater withdrawal wells, and these drawdowns will be further exacerbated by the superimposition of drawdowns associated with the impact of growing regional groundwater use, the impact is considered SMALL, and does not require mitigation.

4.6 Threatened or Endangered Species

Threatened or endangered species is listed as a Category 2 issue in Table B-1 of Appendix B of 10 CFR 51, Subpart A. The issue is listed in Table 4-12.

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected. Consultation under Section 7 of the Endangered Species Act was initiated on October 23, 1997, with the U.S. Fish and Wildlife Service (FWS), and on October 9, 1997, with the National Marine Fisheries Service (NMFS). FWS identified three Federally protected species under their jurisdiction as occurring on the CCNPP

Table 4-12. Category 2 Issues Applicable to Threatened or Endangered Species During the Renewal Term

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

site (see Section 2.2.6). In addition, the NMFS identified the shortnose sturgeon and the loggerhead turtle as potentially occurring in the vicinity of the CCNPP site (see Section 2.2.5). The response letters from FWS and NMFS are included in Appendix E.

FWS concluded that no adverse impacts to listed species would be likely under conditions of license renewal. FWS also recommended a number of conservation measures that have been implemented by BGE. The Nature Conservancy is allowed escorted foot access to the beach below the CCNPP so that censuses of tiger beetles can be conducted. BGE has placed constraints on activities in the vicinity of active bald eagle nests: no nonroutine human activities (e.g., construction, timber harvest, or heavy machinery operation) are allowed within 0.4 km (1/4 mile) of active bald eagle nests during the nesting season (December 15 to June 15) without coordination and approval from MDNR and FWS. BGE has also agreed to initiate consultation with the FWS whenever activities are planned that would result in significant habitat changes within the 0.4 km (1/4 mile) radius of active bald eagle nests, regardless of time of the year.

An additional potential impact on threatened or endangered species is the regulation control and related disturbances associated with routine maintenance of transmission line corridors. The staff has examined the potential impacts on the species listed in Section 2.2.6 and concludes that there is little likelihood that adverse impacts on endangered or threatened species will occur as a result of routine transmission line corridor maintenance activities during the 20-year period of license renewal.

The NMFS concluded that CCNPP license renewal would not adversely affect either the shortnose sturgeon or the loggerhead turtles because the CCNPP discharge/intake does not lie within the areas normally used by either species. There is no evidence that the thermal effects of the CCNPP cooling water discharge would influence periodic migration of the shortnose sturgeon to and from river systems, nor have either the shortnose sturgeon or the loggerhead turtles been found impinged on the intake screen during the 21 years of monitoring data summarized in the BGE impingement study. Thus, operating license renewal should not affect the viability of either of these species or result in further decline.

The staff has completed consultation with NMFS and FWS relative to potential impacts to listed and proposed threatened or endangered species or critical habitats from operations during the renewal term. Based on this consultation, the staff concludes that the impact is SMALL, and mitigation beyond the measures recommended by the FWS and implemented by BGE is not needed.

4.7 Evaluation of Potential New and Significant Information on Impacts of Operations During the Renewal Term

The staff has not identified new and significant information on environmental issues related to operation during the renewal term listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and has conducted its own independent review, including the public scoping meetings, to identify issues with significant new information. During the CCNPP site visit in July 1998, BGE staff stated that measurements of channel intake depths indicated that siltation has occurred since the channel was constructed. BGE indicated that it has no plans to dredge the channel. If conditions changed and maintenance dredging became necessary, an application for a dredging permit, including environmental review of methods of dredging and spoil disposal, would be submitted to the applicable permitting agencies at the appropriate time. This new information is not considered a significant ecological concern relative to CCNPP operation during the renewal term.

The review process also would identify environmental issues that have not been evaluated. During a scoping meeting, a member of the public raised an issue regarding the release to the Chesapeake Bay of microorganisms that may live in extreme heat in spent fuel pools, and the potential threat posed by such a release. This issue is discussed in the following section.

4.7.1 Microorganisms That Live in High Radiation, Extreme Heat Conditions

During the July 1998 scoping meeting, one member of the public referred to an article that had been published in the May 23, 1998, issue of *Science News* (Volume 153, "Something's Bugging Nuclear Fuel") and expressed concerns regarding the potential for microorganisms that can live under extreme heat conditions and be exposed to nuclear radiation (such as within the spent fuel pool) within nuclear power plants. The commenter asked that this issue be considered as part of the scoping process, and specifically that consideration be given to the types of organisms that could live under these conditions, the possibility for mutation, and the consequences of these microorganisms escaping from the plant into the Chesapeake Bay.

In response, the staff investigated and talked with microbiologists that specialized in research on microorganisms that live in extreme heat conditions. The following is a summary of the information that was obtained from the specialists:

Many types of organisms can live quite comfortably in the temperature range of the pools (100 to 150°F or 38 to 65°C). Some organisms (hyperthermophiles) can thrive at temperatures as high as 110°C (230°F) near ocean vents. Thermophilic bacteria have been extensively studied (Alfredsson and Kristjansson 1995). Bacteria in the genus *Thermus* are common inhabitants of hot water tanks, piping, and hot springs, such as those in Yellowstone National Park. Some bacteria are also fairly radiation resistant; *Deinococcus radiodurans* can recover from doses of ionizing radiation as great as 20 kGy. Although most microbes would not be able to exist in the radiation fields near the fuel assemblies, they would be able to survive in the lower radiation fields found at the surface and against the walls of the spent fuel pool.

There is a potential for mutation in all living organisms, but microbes that have high levels of radiation resistance also have developed extremely efficient repair systems. These repair systems have a remarkably high degree of fidelity and would reduce the potential for mutation. Bacteria already thrive in many extreme environments, and while mutations do occur, it is difficult to detect changes in the morphology or physiology of such mutated organisms.

Organisms that are associated with thermal waters of the spent fuel pool are likely to die if they are transferred into much colder waters, such as those of the Chesapeake Bay. If the organisms are truly adapted to thermal conditions, they would not likely be able to survive and compete with the indigenous microbiota of the relatively cold waters of the Chesapeake Bay. Although some bacteria can survive in a dormant state for long periods of time, bacteria in a microbially-active system such as the Chesapeake Bay likely will have a much shorter lifespan due to factors such as predation and competition.

Based on this information, the staff concludes that microorganisms that may inhabit high-radiation, high-temperature environments (such as the spent fuel pool) have little potential for a significant increase in number in the environment, and would not have a deleterious effect on public health as a result of the continued operation of CCNPP during a 20-year license renewal term.

4.8 Summary of Impacts of Operations During the Renewal Term

Neither BGE or the staff is aware of significant new information related to any of the applicable Category 1 issues associated with the CCNPP 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 "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 CCNPP operation during the renewal term and for environmental justice. For 12 issues and environmental justice, the staff concluded that the potential environmental impact of renewal term operations of CCNPP would be of SMALL significance in the context of the standards set forth in the GEIS and that mitigation would not be warranted. The staff also concluded that the potential impacts of CCNPP operating license renewal would be of SMALL significance on threatened or endangered species. Mitigation measures beyond those identified by the FWS and implemented by BGE are not warranted.

In addition, the staff determined that a consensus has not been reached by appropriate Federal health agencies that there are adverse health effects from electromagnetic fields.

4.9 References

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5.0 Environmental Impacts of Postulated Accidents

Environmental issues associated with postulated accidents were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996). The GEIS included 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 were 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 offsite 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

This chapter describes the environmental impacts from postulated accidents that might occur during the license renewal term. The generic potential impacts from postulated accidents have been described in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996a).

5.1 Postulated Plant Accidents

A Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, is applicable to CCNPP postulated accidents and is listed in Table 5-1. BGE stated in its Environmental Report (ER) (BGE 1998a) that it is unaware of any new and significant information related to this Category 1 issue. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to this issue

Postulated Accidents

beyond those discussed in the GEIS. For this issue, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for the issue follows.

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
POSTULATED ACCIDENTS	
Design Basis Accidents (DBA)	5.3.2; 5.5.1

Design Basis Accidents: 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." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of DBAs beyond those discussed in the GEIS.

A Category 2 issue related to postulated accidents that is applicable to CCNPP is discussed in Table 5-2.

Table 5-2. Category 2 Issues Applicable to Postulated Accidents

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Sections
POSTULATED ACCIDENTS			
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

Severe Accidents: Based on information in the GEIS, the Commission found the following: 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." The staff has not identified any significant new information with regard to the consequences from severe accidents in its review of the BGE ER (BGE 1998a), the BGE Final Safety Analysis Report (FSAR) (BGE 1998b), the site visit, the scoping process, its consideration of

public comments, or in its independent evaluation of the available information. 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 CCNPP. The results of its review are discussed in Section 5.2.

5.2 Severe Accident Mitigation Alternatives

It is required in 10 CFR 51.53(c)(3)(ii)(L) that license renewal applicants provide a consideration of alternatives to mitigate severe accidents if the staff has not previously considered SAMAs for the applicant's plant in an EIS or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant design changes with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not previously been considered for CCNPP; therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

BGE submitted an initial assessment of SAMAs for CCNPP in the ER. This assessment was based on an updated version of the CCNPP Individual Plant Examination (IPE) for internal events (BGE 1993), an updated version of the CCNPP Individual Plant Examination for External Events (IPEEE) (BGE 1997), and supplementary analyses of offsite consequences and economic impacts. BGE concluded that none of the candidate SAMAs identified and evaluated were cost-effective for CCNPP. However, BGE was still evaluating three proposed changes at the time the license renewal application was submitted.

Based on a review of the SAMA submittal, the staff issued an RAI to BGE by letter dated September 9, 1998 (NRC 1998b). Major issues concerned the inclusion of averted onsite costs (AOSCs) in BGE's value impact analysis, the effects of uncertainties in risk and cost estimates on the identification of cost-beneficial SAMAs, and the results of BGE's evaluation of the three remaining SAMAs.

BGE submitted additional information by letter dated December 3, 1998 (BGE 1998c). One SAMA, which involves installing a watertight door between the service water pump room and the adjacent fan room to reduce risk from internal flooding, is being considered under BGE's modification process. Several additional SAMAs were also shown to have a positive net value when evaluated in accordance with NRC's regulatory analysis handbook (i.e., when AOSCs are included as benefits). However, BGE concluded that none of these additional SAMAs warrant implementation.

The staff's assessment of SAMAs for CCNPP, which included review of the BGE process and independent staff analysis, follows.

5.2.2 Estimate of Risk for CCNPP

A description of BGE's estimates of the offsite risk at CCNPP is summarized below. The summary is followed by the staff's review of BGE's risk estimates.

5.2.2.1 BGE Risk Estimates

The Calvert Cliffs Probabilistic Risk Assessment (CCPRA) model, which forms the basis for the SAMA analysis, is a Level 3 risk analysis (i.e., it includes treatment of core damage frequency, containment performance, and offsite consequences). The model, which BGE refers to as Update 2, consists of an internal events portion, based on an updated version of the IPE, and an external events portion, based on an updated version of the IPEEE. Major changes in the analysis since the IPE submittal are described in BGE's December 3, 1998, RAI response (BGE 1998c).

Changes in the Level 1 (core damage frequency [CDF]) portion of the analysis following the IPE submittal include improved treatment of success criteria for anticipated transient without scram events, reactor coolant pump (RCP) seal loss of coolant accidents (LOCAs), and low pressure feed; common cause failure of inverters and transformers; and human action dependencies and recovery actions. Some changes resulted in risk reduction and others in risk increase. The net impact of the changes on CDF is small despite the significance of some of these changes due to the offsetting effect of the risk increase and decrease. The BGE SAMA analysis is based on the Unit 1 model, but the impact of the differences between units was considered in the screening and value/impact analysis.

The Level 2 (also called containment performance) portion of the CCPRA model, including the plant damage state descriptors, the Containment Performance Event Tree, and the source term binning and containment release categories, is essentially the same as the IPE Level 2 analysis. The offsite (or Level 3) consequence analyses were carried out using the NRC-developed Melcor Accident Consequence Code System (MACCS), Version 1.5.11.1 (Chanin et al. 1990), and site-specific data for meteorology, population, and evacuation modeling.

BGE estimated the total CDF for internally and externally initiated events to be 3.3×10^{-4} per reactor-year, and the offsite risk to the population within 80 km (50 mi) of the CCNPP site to be about 0.68 person-sievert (person-Sv) (68 person-rem) per reactor-year. The breakdown of the Unit 1 CDF is provided in Table 5-3. It shows that transients are a dominant contributor to CDF, followed by fire and LOCAs.

The breakdown of containment release frequency and population dose by release category is given in Table 5-4. Among the CCNPP conditional containment failure probabilities, early containment failure is about 7 percent, with isolation failure the primary contributor; late containment failure is about 49 percent, with containment over-pressure the primary contributor; and containment bypass is about 2 percent, with steam generator tube rupture the primary contributor. The containment remains intact

Table 5-3. Calvert Cliffs CDF Profile

Accident Category	% of Total (Total CDF = 3.3×10^{-4} /reactor-year)
Transients	48
Fire	22
LOCAs	20
Internal Flood	5
Earthquake	4
Wind	1

42 percent of the time. These results differ from the values reported in the original IPE due to the Level 1 model updates described later. Early containment failure accounts for approximately 94 percent of the population dose, with containment bypass and late containment failures contributing about 3 percent and 2 percent, respectively.

Table 5-4. Contribution of Containment Release Category to Release Frequency and Population Dose

Containment Release Category	Contribution to Containment Release Frequency (%) ^(a)	Contribution to Population Dose (%) ^(b)
Intact Containment	42	1
Late Containment Failure	49	2
Early Containment Failure	7	94
Containment Bypass	2	3

(a) Total release frequency = 3.3×10^{-4} /reactor-year

(b) Total population dose = 0.686 person-Sv (68.6 person-rem) per reactor-year

5.2.2.2 Review of BGE Risk Estimates

BGE's estimate of offsite risk at CCNPP is based on the following three major elements of analysis:

- (1) the Level 1 and 2 risk models for CCNPP that form the bases for the December 1993 IPE submittal (BGE 1993) and the August 1997 IPEEE submittal (BGE 1997)
- (2) the major modifications to the IPE model subsequent to December 1993 (BGE 1998c)
- (3) the extension of the Level 2 Probabilistic Risk Assessment (PRA) model to a Level 3 assessment.

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The staff reviewed each of these analyses/processes to determine the acceptability of BGE's risk estimates for the SAMA analysis. The results of this analyses follow.

The staff's review of the CCNPP IPE is described in an evaluation report dated April 16, 1996 (NRC 1996b). In that review, the staff evaluated the methodology, models, data, and assumptions used to estimate CDF and characterize containment performance and fission product releases. The staff concluded that BGE's analysis met the intent of Generic Letter 88-20 (NRC 1988); that is, the IPE results are reasonable considering the design, operation, and experience of the plant, together with the contributions from initiators and the failure of frontline safety and support systems. The staff also found that the CCNPP IPE compares reasonably with other Combustion Engineering plants, but is highest in CDF. The staff did not identify major shortcomings associated with the licensee's IPE, and further enhancements have since been made to the IPE. The CCNPP IPE identified seven vulnerabilities in the following areas:

- (1) loss of electrical switchgear room cooling
- (2) loss of main feedwater following a plant trip
- (3) loss of auxiliary feedwater (AFW) if valves are inoperable
- (4) loss of pressurizer spray during a steam generator tube rupture because of proceduralized trip of RCPs
- (5) significant challenges to operators following an inadvertent engineered safeguards feature, reactor protection system, and AFW system actuation resulting from failure of two 120V AC buses
- (6) RCP seal LOCA resulting from loss of component cooling water seal cooling
- (7) common cause or maintenance failure of both turbine-driven AFW pumps.

Corrective actions have been implemented that address these vulnerabilities except for the RCP seal LOCA, for which BGE determined no actions are required. The staff notes that the BGE SAMA analysis considered potential modifications in RCP seal LOCAs. Therefore, the staff concludes that the internal events portion of CCPRA provides an acceptable platform for assessing the risk reduction potential of SAMAs.

The staff's review of the licensee's IPEEE is currently underway. The preliminary results did not identify any significant shortcomings or deficiencies. A cursory review of the BGE submittal finds that the overall method, scope, and level of detail are generally comprehensive. The staff also notes that the BGE IPEEE has been subjected to both internal and external peer reviews. In the IPEEE, BGE identified several plant improvements from external events, and these have been implemented or are

planned and being tracked for resolution. These improvements address/include switchgear room ventilation recovery during a hurricane, smoke infiltration into the control room via ventilation intake, inadvertent isolation of switchgear room and cable spreading room ventilation, fire barrier inspections, and control of transient ignition sources in the cable chases. The BGE SAMA analysis is based on the updated version of the IPEEE. The applicant stated (BGE 1998c) that the updated version, CCPRA, is slightly different from the IPEEE (BGE 1997). Based on these findings, the staff concludes that the external events portion of CCPRA provides an acceptable platform for assessing the risk reduction potential of SAMAs.

The changes to the IPE resulting from incorporating the PRA modifications previously discussed were not extensively evaluated as part of the present review. However, the staff notes that BGE made an extensive effort to update and maintain the CCPRA to reflect the as-built and as-operated condition of the plant, and that the CDF and risk estimates are the results of a detailed PRA model, which has been subjected to both staff and peer reviews. Furthermore, because the principal role of the CCPRA is to screen potential SAMAs, precise CDF and risk estimates are not critical to the analysis. Therefore, the staff concludes that the results of the CCPRA are adequate for purposes of meeting the SAMA evaluation requirement.

The staff reviewed the process used by BGE to extend the containment performance (Level 2) portion of the IPE to the offsite consequence (Level 3) assessment. This included consideration of the source terms used to characterize fission product releases for each containment release category and the major input assumptions used in the MACCS analyses. This information is provided in Section F.1 of the ER and in BGE's responses to requests for additional information.

BGE used the Modular Accident Analysis Program code to analyze postulated accidents and develop radiological source terms for each of six containment release categories: intact containment, late containment failure, early containment failure (which is also further divided into large and small), and containment bypass (which is also further divided into large and small). These source terms were incorporated within the MACCS analysis as either a single puff release or split into two plume segments with different release times to represent the time variation in the releases. The staff reviewed BGE's source term estimates for the major release categories and found these predictions to be in reasonable agreement with estimates of NUREG-1150 (NRC 1990a) for the closest corresponding release scenarios. The staff concludes that the assignment of source terms is acceptable.

The MACCS input used site-specific meteorological data processed from measurements taken during 1993. Data from 1993 were used because they were the most readily available data in 1995 when the offsite consequence (Level 3) analysis was performed. BGE indicates that a review of the 1993 data show that they are well within the normal trend for meteorology at the CCNPP site. Therefore, the staff considers this data representative of the climate for the site.

The population distribution around the CCNPP site was based on the projected permanent resident population for the year 2030. This projection was based on 1990 census data, based on county population projections provided by various State planning agencies. These were the most current population projections at the time the consequence analysis was performed. More recent population projections indicate slight (less than 10 percent) increases in some counties and decreases in other counties relative to the projections on which the SAMA evaluation was based (NRC 1999). The net change is a 0.2 percent decrease in the projected total population within a 80-km (50-mi) radius of the plant. Thus, the population projections used in the SAMA analysis remain valid.

Site-specific economic data were used in the MACCS code. Land-use statistics, including farmland values, farm product values, and other factors were provided on a County-wide and State-wide basis for distances out to 80 km (50 mi). The majority of these data were taken from the MACCS Users Manual or NUREG-1150 and are considered by the staff to provide a reasonable representation of the estimated offsite costs of a severe accident.

Evacuation modeling is based on site-specific evacuation studies carried out by BGE. It was assumed that only 95 percent of the people within the plume exposure pathway emergency planning zone would participate in the evacuation. The remaining 5 percent are assumed to be unable or unwilling to evacuate, and are assumed to go about their normal activities for 24 hours. This assumption is conservative relative to the NUREG-1150 study, which assumed evacuation of 99.5 percent of the population within the emergency planning zone.

The staff concludes that the methodology used by BGE to estimate the CDF and offsite consequences for CCNPP 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 BGE.

5.2.3 Potential Design Improvements

The process for identifying potential design improvements, the staff's evaluation of this process, and the design improvements evaluated in detail by BGE are discussed in this section.

5.2.3.1 Process for Identifying Potential Design Improvements

BGE identified an initial list of 158 potential design improvements through a process consisting of the following steps:

- (1) consideration of significant plant issues that contributed to large numbers of sequences, and of issues that indicated a higher likelihood of being risk-beneficial. This is based mainly on the risk insights from the extensive PRA knowledge and experience of the BGE personnel.

- (2) review of insights from other plant-specific risk studies and from generic containment improvement studies. This included insights from the IPE program presented during a public workshop on the IPE and documented in NUREG-1560 (NRC 1997a), and design improvements for large dry pressurized water reactor containments identified through the NRC Containment Performance Improvement Program (NRC 1990b).
- (3) review of plant improvements evaluated in previous severe accident mitigation design alternative analyses for other operating nuclear plants (Watts Bar [NRC 1995a], Comanche Peak [NRC 1989a], and Limerick [NRC 1989b]), and for advanced light water reactor designs (ABB-CE System80+ [NRC 1994] and Westinghouse AP600 [NRC 1998c]).

As a preliminary screening, BGE eliminated any SAMAs that are not applicable to CCNPP (e.g., enhancements applicable only to boiling water reactors), already implemented at CCNPP (e.g., automatic transfer to containment sump recirculation), or related to RCP seal injection. Improvements to RCP injection were eliminated because CCNPP, like other Combustion Engineering plants, does not have an RCP seal injection system. However, SAMAs to reduce the frequency of sequences involving RCP seal LOCA and a SAMA to replace the existing RCP seal system with a seal injection system were retained in the evaluation. Based on the preliminary screening, BGE designated 97 of the original SAMAs for further study. Several SAMAs are multiple-part and effectively add 8 more SAMAs, bringing the total number of SAMAs identified for further study to 105. These SAMAs address the spectrum of contributors to containment release for CCNPP.

As a final screening, BGE eliminated additional SAMAs, based on a preliminary value-impact analysis. As a first step, BGE redefined the conceptual SAMAs in terms of CCNPP-specific design improvements. Based on the more specific SAMA description, a number of potential SAMAs were screened out because they are already addressed in the current design. The benefits and costs associated with the remaining SAMAs were estimated as described later. BGE then eliminated those SAMAs whose cost was expected to exceed the maximum attainable benefit (estimated by BGE to be \$2.3 million) and those hardware items having an estimated monetized benefit of less than \$40,000. On the basis of this screening, BGE identified 26 SAMAs for further analysis. This includes three SAMAs that were still under review by BGE at the time the ER was submitted.

BGE did not include several factors in the treatment of onsite economic costs. Specifically, the onsite property damage costs associated with cleanup and decontamination were not included on the basis that such costs are covered by property damage insurance. Also, BGE did not include replacement power costs as an onsite economic cost on the basis that such costs are unlikely to be incurred by the utility in a deregulated energy market. In view of the significant impact of AOSCs on both the estimated benefit for each SAMA and the maximum attainable benefit (i.e., the benefit associated with eliminating all core damage events), the staff requested that BGE include AOSCs in the estimation of benefits for each affected SAMA, update the value for the maximum attainable benefit based on inclusion of AOSCs, and update the SAMA screening accordingly.

| In the response to the RAI, BGE updated the benefit estimates for all SAMAs and updated the
| maximum attainable benefit (from \$2.4 million to \$8.6 million) to account for inclusion of AOSCs. BGE
re-screened the SAMAs using these revised benefit estimates. BGE compiled a list of the 10 SAMAs
with the highest calculated net values and compared these SAMAs with a similar list based on their
| original screening (which did not include AOSCs). The revised list includes 9 of the 26 SAMAs
| identified by BGE in its ER and the following SAMA that was previously excluded because of a high cost
of enhancement: "Install high capacity power operated relief valves (PORVs) such that a single PORV
is capable of providing adequate decay heat removal (SAMA 77)." BGE included this additional
improvement along with the 9 other SAMAs identified for further analysis.

5.2.3.2 Staff Evaluation

| BGE's effort to identify an initial list of potential SAMAs focused primarily on areas associated with
internal initiating events. The initial list of SAMAs generally coincide with accident categories that are
dominant CDF contributors or with issues that tend to have a large impact on a number of accident
sequences at CCNPP. Though BGE did not fully take advantage of the CCPRA and the capabilities of
| the detailed model, it made a reasonable effort to search for potential SAMA candidates, using the
knowledge and experience of its PRA personnel, reviewing insights from other plant-specific studies,
and reviewing plant improvements in previous SAMA analyses. The staff also finds that the CCNPP
IPEEE has identified several plant improvements. These have been implemented or are planned and
being tracked for resolution. It is also noted that none of the previous SAMA analyses for operating
plants included an explicit search for SAMAs associated with external initiating events. Additionally,
BGE uses both its internal and external event PRA model for estimating risk benefit of SAMAs that are
screened in for further evaluation. Therefore, the staff concludes that BGE's effort to search for
potential SAMAs is reasonable.

The staff reviewed the set of potential enhancements resulting from BGE's preliminary screening
process (listed in Appendix F.2 of BGE's ER). The SAMAs include improvements oriented toward
reducing the CDF and risk from major contributors specific to CCNPP; improvements identified as part
of the NRC containment performance improvement program; several accident management strategies
identified by NRC in Generic Letter 88-20, Supplement 2 (NRC 1990c); and improvements identified in
previous severe accident mitigation design alternatives (SAMDA) reviews for Watts Bar, Comanche
Peak, and Limerick that would be applicable to CCNPP. The staff notes that while many of the SAMAs
involve major modifications and significant costs, less expensive design improvements and procedure
changes that provide similar levels of risk reduction are also included. The SAMAs also include a
filtered containment vent and flooded rubble bed core retention device, which are cited specifically in
NUREG-0660 (NRC 1980) for evaluation as part of Three Mile Island Task Action Plan Item II.B.8. The
staff concludes that the set of potential SAMAs considered by BGE is reasonably complete and
comprehensive.

As mentioned previously, BGE performed a final screening by eliminating those SAMAs whose cost exceeded the maximum attainable benefit (estimated by BGE to be \$2.3 million), and those hardware items having an estimated monetized benefit less than \$40,000. AOSC were omitted in the original screening process (documented in the ER), but the impact of AOSCs was subsequently evaluated by BGE in response to a staff request. The screening process and criteria appears reasonable.

The staff confirmed BGE's SAMA identification process by performing an independent screening of those SAMAs remaining following BGE's preliminary screening, as described in Section 5.2.6. The staff's screening did not identify any hardware changes that were not already included within the 27 SAMAs identified by BGE. This includes the original 23 SAMAs identified by BGE, the three additional SAMAs still under review by BGE at the time the ER was submitted, and the previously excluded SAMA related to the installation of the PORVs (SAMA 77). Several SAMAs involving procedure improvements were indicated to be cost-beneficial through the staff's screening. These SAMAs had been separately considered by BGE and eliminated in the final screening because (1) the improvement beyond the current plant procedures assumed in the analysis is not realistically achievable, or (2) in the case of flood mitigation procedures, the procedure change would need to be re-evaluated following disposition of SAMA 66b (implement hardware modifications to prevent flood propagation). Elimination of these SAMAs for the reasons provided by BGE appears reasonable.

The staff concludes that BGE has used a systematic and comprehensive process for identifying potential design improvements for CCNPP, and that the set of potential design improvements identified by BGE and supplemented based on inclusion of AOSCs, is reasonably comprehensive and, therefore, acceptable.

5.2.3.3 Design Improvements Evaluated in Detail by BGE

A brief summary of the 27 improvements evaluated further by BGE and the anticipated benefits of each is provided in the discussion below. The numbers in parentheses correspond to the SAMA number in BGE's submittal.

Improvements Related to RCP Seal LOCAs (Loss of Component Cooling Water or Saltwater)

- Modify the plant such that, during emergency conditions, the saltwater, service water, and component cooling water pumps automatically start when the operating pump fails (1a) - This would increase the time before the loss of component cooling in the loss of essential raw cooling water sequences and reduce the potential for RCP seal failure.
- Modify the plant such that, during normal operating conditions, the saltwater, service water, and component cooling water pumps automatically start when the operating pump fails (1b) - This would increase the time before the loss of component cooling water in the loss of essential raw cooling water sequences and reduce the potential for RCP seal failure.

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- Modify fire protection system piping to the component cooling water system to provide alternate cooling for the shutdown cooling heat exchangers, the safety injection pump, and RCP seals (5) - This would reduce the impact of a loss of component cooling by providing a means to maintain the reactor coolant pump seals after a loss of component cooling water.
- Implement procedures to stagger high-pressure safety injection pump use after a loss of saltwater (96) - This would allow extended use of high-pressure safety injection after the Saltwater System loss, which causes the emergency core cooling system (ECCS) pump room coolers to be lost.

Improvements Related to Heating, Ventilation, and Air Conditioning

- Install a redundant and diverse AFW pump room ventilation system that automatically starts on high temperature (7) - This would improve the reliability of AFW when room cooling is lost.

Improvements Related to Ex-Vessel Accident Mitigation/Containment Phenomena

- Install containment spray pump header automatic throttle valves (8) - This would extend the time over which water remains in the refueling water storage tank, when full spray flow is not needed.
- Install a passive hydrogen ignition system (15) - This would reduce the potential for hydrogen detonations without requiring electric power.
- Upgrade the fire protection system and hard-pipe a connection to the containment spray system, such that the fire protection system can serve as a back-up source for containment spray (23) - This would provide a redundant source of water for containment spray, at a lower cost than a dedicated system.

Improvements in Alternating Current (AC)/Direct Current (DC) Power Reliability and Availability

- Provide additional DC battery capability (31) - This would extend the availability of DC power when battery charging is lost, thereby reducing the frequency of long-term station blackout core melt sequences and other losses of 125V DC power core melt sequences.
- Use fuel cells instead of lead-acid batteries (32) - This would extend the availability of DC when battery charging is lost, thereby reducing the frequency of long-term station blackout core melt sequences and other losses of 125V DC power core melt sequences.
- Implement automatic cross-tie capability between 4kV buses 11 and 14 (33a). This would ensure that either bus experiencing an under-voltage condition would be fed automatically from the other bus, thereby improving AC power reliability.

- Implement automatic cross-tie capability between 4kV buses 21 and 14 (33b). This would ensure that either bus experiencing an under-voltage condition would be fed automatically from the other bus, thereby improving AC power reliability.
- Modify the plant such that a portable generator could be used to directly feed each of the four 125V DC buses (34) - This would reduce the likelihood of battery depletion, thereby reducing the frequency of long-term station blackout core melt sequences and other losses of 125V DC power core melt sequences.
- Replace batteries with a more reliable model (36) - This would improve DC power reliability, thereby reducing the frequency of station blackout core melt sequences and other losses of 125V DC power core melt sequences.
- Double the capacity of the fuel oil day tanks (38b) - This would extend the operability of the diesel generators, thereby reducing the frequency of long-term station blackout core melt sequences.
- Make the service water-cooled emergency diesel generators air-cooled (44) - This would eliminate the dependency of diesel generators on cooling water support systems, thereby reducing the frequency of station blackout core melt sequences.
- Use the fire protection system as a back-up source for diesel cooling (45) - This would provide a redundant source for diesel generator cooling, thereby reducing the frequency of station blackout core melt sequences.
- Convert under-voltage, auxiliary feedwater actuation signal (AFAS), and reactor protective system high pressurizer pressure actuation signals to 3-out-of-4 logic (48a) - This would reduce the risk associated with 2/4 inverter failure, which was found to be a significant contributor to core damage frequency in the CCPRA.
- Operate with the power-operated relief valve block valves shut (48b) - This modification would increase the demands on the safety relief valves; however, the PORVs would be less likely to spuriously open and would still be available for feed-and-bleed.
- Add an automatic bus transfer feature that would automatically transfer the 120V vital AC bus from the online unit to the standby unit upon failure of the operating inverter (49) - This would eliminate the manual action currently required to place the standby unit online, thereby reducing the frequency of spurious safety system actuation sequences (SSSAs).

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Improvements in Identifying/Coping with Containment Bypass

- Install additional instrumentation for detecting intersystem LOCAs (59) - Installing pressure or leak monitoring instruments between the first two pressure isolation valves on low-pressure injection lines, residual heat removal suction lines, and high-pressure safety injection lines, would reduce the potential for interfacing system LOCA events.

Improvements to Reduce Internal Flooding Frequency

- Implement internal flood prevention and mitigation enhancements (e.g., watertight doors) to prevent flood propagation (66b) - Installing a watertight door between the service water pump room and the adjacent fan room would prevent floods from propagating out of the service water pump room, as well as floods from passing into this room, and would eliminate a significant portion of the risk from plant flooding.

Improvements in Feedwater/Feed-and-Bleed Reliability and Availability

- Install separate accumulators for the AFW cross-connect and block valves to separate this equipment from the constant bleed equipment (e.g., AFW flow control valves) (68) - This would enhance the operator's ability to operate the AFW cross-connect and block valves following a loss of air support.
- Increase the capacity of Condensate Storage Tank (CST) 12 to contain 24 hours of AFW inventory for both units (69) - This would permit the operation of secondary side cooling for an extended period, thereby reducing the frequency of long-term loss of feedwater core damage sequence, and other core damage sequences.
- Provide a means to cool the turbine-driven AFW pumps in a station blackout event (70) - This would permit the operation of AFW for an extended period, thereby reducing the frequency of long-term station blackout core melt sequences.
- Automate demineralized water make-up to CST12 (74) - Automating this function and providing a dedicated diesel generator for this purpose would permit continued inventory make-up to the CST during a loss of offsite power, thereby reducing the frequency of long-term loss of feedwater core melt sequences, as well as enhancing Service Water and Component Cooling Water System make-up capabilities.
- Install high-capacity PORVs such that a single PORV is capable of providing adequate decay heat removal (77) - This would permit successful feed-and-bleed with operation of just one of the two PORVs, thereby improving the availability of feed-and-bleed.

5.2.4 Risk Reduction Potential of Design Improvements

The process used by BGE to determine the risk reduction potential for each enhancement is described in Section 4.1.17.4 of the ER. This process involved determining the approximate effect that the design change would have on top events on the related event tree, reflecting that impact by modifying the saved sequences, and calculating a new value of CDF and total risk (expressed in terms of offsite population dose, offsite economic costs, onsite dose, and onsite economic costs). A spreadsheet was used to total the plant damage states resulting from the various sequences, transfer the plant damage state frequency to the appropriate release categories, and translate the release category frequencies into each of the four risk impacts (offsite population dose, offsite economic costs, onsite dose, and onsite economic costs). The resulting risk impacts were subtracted from the base case risk impacts to calculate the "averted" risk.

BGE evaluated the risk reduction potential for each SAMA in a bounding fashion, i.e., each SAMA was assumed to completely eliminate all sequences that the specific enhancement was intended to address. A bounding approach was taken to reflect the generic nature of the initial SAMA concepts and to allow each SAMA benefit to be calculated using "saved sequences" rather than requantifying the CCNPP. As a result of these bounding approximations, the benefits are generally overestimated. A more detailed evaluation of a specific enhancement may result in a significant reduction in the estimated benefit. BGE's basis for estimating the risk reduction for each design improvement is given in BGE (1998a). The corresponding risk reduction estimates (core damage frequency reduction and offsite dose reduction) are listed in Table 5-5.

The staff has reviewed BGE's bases for calculating the maximum risk reduction for the various design improvements. The staff notes that BGE used judgment in assessing the impact of each design change with regard to estimating averted offsite risk on the CCNPP risk profile. However, the rationale and assumptions on which the risk reduction estimates are based are reasonable and generally conservative. Accordingly, the staff based its estimates of averted risk for the various SAMAs on BGE's risk reduction estimates.

5.2.5 Cost Impacts of Candidate Design Improvements

BGE's method for determining costs for each potential design enhancement is described in Section 4.1.17.3 of the ER. The cost analyses for specific SAMAs are documented in Appendix F.4 of the ER. Revised cost estimates for several SAMAs are provided in the response to the NRC request for additional information (RAI), and in the presentation materials provided during a January 7, 1999, meeting with BGE (NRC 1999).

BGE developed cost estimates for each implementation option from either a site-specific cost estimate, estimates from other licensee submittals, or through application of engineering judgement. The site-specific estimates consider seven major cost categories (BGE labor, labor burden, material,

Table 5-5. Value-Impact Results for Potentially Cost Beneficial SAMAs

SAMA	SAMA Description	Percent Reduction Based on Bounding Estimate		Cost of Enhancement (\$)	Net Value as Estimated by BGE (\$) ^(c)			
		CDF ^(a)	Offsite Dose ^(b)		Bounding Estimate		Best Estimate ^(d)	
					w/o AOSCs	w/ AOSCs	w/o AOSCs	w/AOSCs
"TOP 10" SAMAS BASED ON BGE'S REVISED SCREENING								
7	Redundant AFW pump room ventilation system	1	2	282,000	(234,000)	(144,000)	(197,000)	(116,000)
34	Provide alternate battery charging capability	4	3	222,000	(150,000)	129,000	(160,000)	(36,000)
36	Replace batteries with more reliable model	9	5	375,000	(245,000)	287,000	(189,000)	210,000
38b	Double the capacity of fuel oil day tanks	5	4	674,000	(586,000)	(245,000)	(572,000)	(368,000)
45	Use fire protection system as backup to diesel generator cooling	9	7	1,950,000	(1,770,000)	(1,180,000)	(1,690,000)	(809,000)
48a	Change Under-voltage , AFAS, pressurizer actuation logic	30	17	598,000	(185,000)	1,550,000	(321,000)	284,000
48b	Operate with PORVs blocked	1	<1	125,000	(109,000)	(21,000)	(102,000)	(36,000)
68	Add accumulators for AFW block valves	3	2	268,000	(223,000)	(56,000)	(167,000)	27,000
74	Automate dDemineralized water make-up to CST 12	5	3	376,000	(308,000)	17,000	(239,000)	106,000
77	Increase size of PORVs	46	45	3,500,000	(2,450,000)	470,000	(2,470,000)	(1,020,000)
SAMAS UNDER EVALUATION AT TIME OF ENVIRONMENTAL REPORT								
49	Add automatic bus transfer feature	30	17	884,000	(480,000)	1,300,000	(607,000)	(2000)
66b	Install watertight door for internal floods	5	37	100,000	-----Consider Under Modification Process-----			
96	Procedure to stagger high pressure safety injection pump operation	16	9	NA	----- Eliminate Based on Adverse Impacts -----			

(a) Total CDF = 3.3E-4/reactor-year.

(b) Total offsite dose = 68.6 person-rem/reactor-year.

(c) Average value per unit, assuming SAMA is implemented at both units.

(d) Includes effect of doubling averted public exposure (APE) and the averted offsite costs (AOC) benefits, and accounting for PRA modeling changes and Unit1/Unit2 differences.

material handling, equipment maintenance, indirect supervision and engineering, and allowance for funds used during construction) with subcategories defined by the requirements of the proposed enhancement (e.g., development of training, nuclear regulatory matters, equipment qualification). To provide common grounds for comparison with the monetized benefits values, implementation cost estimates were calculated based on a single-unit implementation basis. The costs did not include the cost of replacement power during extended outages required to implement the modifications and did not generally include contingency costs associated with unforeseen implementation obstacles. Estimates based on modifications that were implemented or estimated in the past were presented in terms of dollar values at the time of implementation (or estimation) and were not adjusted to present-day dollars.

The staff notes that a number of simplifying assumptions appear to have been employed in developing the cost estimates. On balance, however, the staff detected no systematic bias in the resulting cost estimates due to reliance on these assumptions. For example, failure to include replacement energy costs, contingencies, and present-day dollars would tend to understate costs, whereas, calculations based on a single-unit implementation basis are likely to overstate the actual per-unit cost.

The costs for several SAMAs were singled out for review based on the estimated net value, and the potential for significant risk reduction for these SAMAs, specifically SAMAs 45, 48a, 49, and 77. For certain improvements, the staff also compared BGE's cost estimates with estimates developed elsewhere for similar improvements, even though the bases for some of these cost estimates were different. The staff considered the cost estimates developed as part of the evaluation of design improvements for operating reactors (Watts Bar, Comanche Peak, and Limerick) and for the evolutionary advanced light-water reactors.

In general, BGE's cost estimates are judged to reflect valid bases and assumptions, and their accuracy is considered sufficient to provide a reasonable and appropriate basis for the SAMAs analyses, given the uncertainties surrounding the underlying cost estimates and the level of precision necessary considering the greater uncertainty inherent on the benefit side, with which these costs were compared. Accordingly, the staff adopted BGE's cost estimates for the various candidate improvements.

5.2.6 Benefit-Cost Comparison

The benefit-cost comparison as evaluated by BGE and the staff's evaluation of the benefit-cost analysis are described in the following sections.

5.2.6.1 BGE Evaluation

The methodology used by BGE to perform the CCNPP SAMA analysis was based primarily on NRC's guidance for performing benefit-cost analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook*. In accordance with the guidance, BGE estimated the "net value" added by each

Postulated Accidents

SAMA to determine whether any of the SAMAs would be cost-beneficial. The net value is the sum of the dollar equivalents for each severe accident impact (offsite population exposure, offsite economic costs, onsite dose, and onsite economic costs) minus the cost of implementing the SAMA. 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 is not considered cost-beneficial.

BGE calculated the net value for each SAMA using 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 (\$)

AOSC = present value of averted onsite costs (\$)

COE = cost of enhancement (\$)

The derivation of each of these factors is discussed below.

Averted Public Exposure

APE costs were calculated using the following formula:

$$\begin{aligned} \text{APE} = & \text{Annual reduction in public exposure risk } (\Delta \text{person-rem/reactor-year}) \\ & \times \text{monetary equivalent of unit dose} \\ & \times \text{present value conversion factor} \end{aligned}$$

BGE estimated the annual reduction in public exposure risk for each SAMA. The reduction in public exposure (person-rem per year) was converted to a monetary equivalent by applying NRC's conversion factor of \$2000 per person-rem, and then discounting the monetary equivalent to present value. A 20-year period for the license renewal period and a 7 percent real discount rate was assumed, resulting in a present value conversion factor of 10.76 for the base case.

As stated in NUREG/BR-0184, it is important to note that the monetary value of 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.

Averted Offsite Property Damage Costs

AOCs were calculated using the following formula:

$$\text{AOC} = \sum \{ [\text{Release category frequency with SAMA} - \text{release category frequency without SAMA}] \\ \times \text{offsite economic costs associated with release category} \} \\ \times \text{present value conversion factor}$$

BGE determined the offsite economic costs for each containment release category using the MACCS code. AOCs are the product of the change in the release category frequency and the offsite economic costs for each release class, summed over all release categories. Calculated values for offsite economic costs were discounted to present value in the same manner as for public exposure.

Averted Occupational Exposure

AOE was calculated using the following formula:

$$\text{AOE} = \text{Annual CDF reduction} \\ \times \text{occupational exposure per core-damage event} \\ \times \text{present value conversion factor}$$

BGE derived the values for averted occupational exposure based on information provided in Section 5.7.3 of NUREG/BR-0184. Immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used for best estimate values. The present value of these doses was calculated using equations provided in the handbook, in conjunction with a monetary equivalent of unit dose of \$2000 per person-rem, a real discount rate of 7 percent, and a time period of 20 years to represent the license renewal period.

Averted Onsite Costs

AOSCs include averted cleanup and decontamination costs, and averted power replacement costs. BGE derived the values for AOSCs based on information provided in Section 5.7.6 of the regulatory analysis handbook. Averted cleanup costs (ACC) are calculated using the following formula:

$$\text{ACC} = \text{Annual CDF reduction} \\ \times \text{present value of cleanup costs per core-damage event} \\ \times \text{present value conversion factor}$$

The net present value for cleanup and decontamination of a severe accident is given as \$1.1 billion in NUREG/BR-0184 (discounted over 10 years). Use of a discount factor of 10.76 to account for the 20-year license renewal period yields an integrated cleanup cost of \$12 billion. This value was

multiplied by the annual reduction in core damage frequency to obtain the averted cleanup costs portion of the AOSCs.

Long-term replacement power costs (U_{RP}) are calculated using the following formula:

$$U_{RP} = \text{Annual CDF reduction} \\ \times \text{present value of replacement power for a single event} \\ \times \text{factor to account for remaining service years for which replacement power is required} \\ \times \text{reactor power scaling factor}$$

In accordance with guidance provided in Section 5.7.6.2 of NUREG/BR-0184, BGE estimated the net present value of replacement power for a single event to be $\$9.73 \times 10^8$, based on a real discount rate of 7 percent and a 20-year license renewal period. This value was multiplied by a factor of 8.1 to obtain a summation of the single-event costs over the entire license renewal period. After applying a correction factor to account for CCNPP's size relative to that of the generic reactor described in NUREG/BR-0184, the U_{RP} were determined to be \$7.3 billion. This value was multiplied by the annual reduction in core damage frequency to obtain the averted replacement costs portion of the AOSCs.

Although BGE calculated AOSCs, they chose to omit AOSCs as a benefit in the original screening and value-impact analysis submitted in the ER. Onsite property damage costs associated with cleanup and decontamination were not included on the basis that such costs are covered by property damage insurance. Replacement power costs were not included as an onsite economic cost on the basis that such costs are unlikely to be incurred by the utility in a deregulated energy market. None of the SAMAs were found to have a positive net value when AOSCs are omitted. To explore the sensitivity of the results to changes in the discount rate, BGE also recalculated the net value of the 10 most promising SAMAs (those having the highest net values) using a 3-percent discount rate in place of the 7-percent discount rate used in the base case analysis. Reducing the discount rate increases the net value of potential SAMAs and reorders their ranking, but the net value for each of the top 10 SAMAs remained negative even at the lower discount rate.

In response to a staff request, BGE provided a subsequent reassessment in which AOSCs were included as benefits. This information is described in the response to the RAI, and supplemented in the presentation materials from the January 7, 1999, meeting with BGE (NRC 1999a). BGE reviewed each of the 23 SAMAs identified in Table 4-3 of the ER to determine the revised net values when AOSCs are included as benefits. Additionally, BGE revisited the benefit estimates for all SAMAs that were screened out from consideration because the cost of enhancement exceeded the maximum possible benefit. Revised cost estimates were also developed for several SAMAs. An updated list of the 10 SAMAs with highest net values was developed. The updated list includes 9 of the 23 SAMAs identified in Table 4-3 of the ER, plus 1 SAMA originally excluded because of a high implementation cost.

Five of the top 10 SAMAs have a positive net value when AOSC are included and bounding risk reduction benefits are assumed. The remaining 5 SAMAs have a negative net value, even after including these conservative factors. Consequently, BGE performed a more-detailed evaluation of the benefits associated with these SAMAs. This evaluation attempted to (1) remove some of the conservatism in the bounding analysis by establishing a best-estimate benefit; (2) account for the impact of several changes to the CCNPP plant model that were recommended based on a contractor review of the model, but not implemented in the CCPRA used for the SAMA analysis; and (3) account for design differences between Unit 1 and Unit 2 with regard to emergency diesel generator support systems. For each SAMA, a lower bound CDF estimate, representing the minimum benefit that could be expected, was established quantitatively using the saved sequences. (The upper bound CDF estimate was based on the bounding estimate used in the original SAMA analysis.) The best-estimate risk reduction value was qualitatively established based on consideration of the degree of conservatism built into the lower-bound and upper-bound estimates. The best-estimate benefits were also adjusted to account for possible changes in the economic and evacuation time assumptions used in the MACCS analysis. Specifically, the estimates of averted offsite costs were doubled to bound possible changes to the economic input data due to inflation, and the estimates of averted public exposure were doubled to bound increased evacuation times resulting from increased population.

The three SAMAs that were still being reviewed by BGE at the time the ER was submitted were not included within the set of SAMAs discussed above. The results of BGE's further evaluation of the three SAMAs was provided in BGE (1998c). BGE has determined that one of these SAMAs may be cost-beneficial when evaluated under the assumptions used in the ER, i.e., neglecting AOSCs. This SAMA (66b), which involves installing a watertight door between the service water pump room and the adjacent fan room to reduce risk from internal flooding, is being considered under CCNPP's modification process. A second SAMA (49), which involves adding an automatic bus transfer feature, was found to be cost-beneficial when AOSCs are included, and was further evaluated under best-estimate assumptions. BGE concluded that based on the small positive net value and the fact that the estimated benefits are conservative when applied to this SAMA, this SAMA is not risk-beneficial. The remaining SAMA (96), which involves a procedure change to stagger high-pressure safety injection pump operation after a loss of saltwater cooling, was eliminated based on adverse safety impacts.

BGE's estimates of the net values for the top 10 SAMAs are presented in Table 5-5 for both bounding and best-estimate risk reduction values, and with and without AOSCs. Information related to the three additional SAMAs evaluated by BGE is also included. All SAMAs have a negative net value when AOSCs are not included. When AOSCs are included, SAMAs 34, 36, 48a, 49, 74, and 77 were found to be cost-beneficial under bounding risk reduction assumptions. Under best-estimate assumptions, the net value remains positive for only SAMAs 36, 48a, and 74, but SAMA 68 also becomes cost-beneficial. The net value for certain SAMAs (including SAMA 68) is greater under best-estimate assumptions than under bounding assumptions due to the combined effect of doubling APE and AOC benefits and accounting for modeling changes and Unit1/Unit2 differences in the best-estimate case.

BGE dispositioned certain SAMAs based on their net values under the best-estimate assumptions. BGE concluded that implementation of SAMAs 7, 34, 38b, 45, 48b, 49, and 77 is not justified under best-estimate assumptions since these SAMAs have a negative net value irrespective of whether AOSCs are included. SAMAs 36, 48a, 68, and 74, which were found to have a positive net value when AOSCs were included, were dispositioned on the basis of other considerations.

- SAMA 36, "Replace batteries with a more reliable model," was judged to be not feasible, based on the reliability record of modern lead-acid batteries, and the unproven reliability of other battery designs.
- SAMA 48a, "Convert under-voltage, AFAS block, and high pressurizer pressure logic to 3-out-of-4 logic," was judged to have a negative net value when all of the costs of the regulatory aspects of the modification are taken into account. (Some, but not all regulatory costs were included in BGE's cost estimate.)
- SAMA 68, "Install separate accumulators for the AFW cross-connect and AFW block valves," has a positive net value only when AOSCs are included in the analysis. BGE's position is that replacement power costs and insured onsite property costs are not appropriate considerations for a NEPA analysis, such as the SAMA analysis.
- SAMA 74, "Automate demineralized water (DW) make-up to condensate storage tank," has a positive net value only when AOSCs are included in the analysis. BGE's position is that replacement power costs and insured onsite property costs are not appropriate considerations for a NEPA analysis, such as the SAMA analysis.

Based on the above factors, BGE has decided not to pursue any of these SAMAs further. The staff independently considered these SAMAs further as discussed in the next section.

5.2.6.2 Staff Evaluation

The methodology used by BGE to perform the CCNPP value-impact analysis was based primarily on NUREG/BR-0184 (NRC 1997b). The only noted difference in BGE's analysis concerned omission of AOSCs in the SAMA analysis contained in the ER. The NRC's regulatory analysis guidelines in NUREG/BR-0184 consider a societal perspective in the performance of regulatory analyses and state that AOSCs, including cleanup and decontamination costs and replacement power costs, should be treated as benefits in the value impact analysis. The Commission reaffirmed the NRC staff treatment of AOSCs in regulating analyses by an SRM to SECY-99-169 (NRC 1999b). According to the regulatory analysis guidelines, insurance payments are transfer payments that do not involve consumptive use of real resources, and therefore are not a relevant basis for excluding AOSC. Similarly, NUREG/BR-0184 states that replacement power costs should be included as impacts. This handbook also states that where consideration of AOSCs is expected to alter or significantly affect results, the results should be

calculated with and without AOSCs, so that the decisionmaker is fully aware of its overall effect on the benefit and cost considerations of the alternatives. In view of the significant impacts of AOSCs, the staff has chosen to display SAMA results both with and without AOSCs.

The staff confirmed BGE's SAMA identification process by performing an independent screening of those SAMAs remaining following BGE's preliminary screening. The staff estimated the net value for each SAMA with and without AOSCs. In accordance with the regulatory analysis guidance, the staff assumed a present worth discount rate of 7 percent for the base case, and performed a sensitivity case assuming a 3 percent discount rate. The staff relied on BGE's bounding estimates of core damage frequency and offsite consequence reduction (provided in BGE 1998a), BGE's cost estimates for each SAMA (provided in BGE 1998a and 1998c), and the handouts from the January 7, 1999 (NRC 1999a), public meeting with BGE. The staff used bounding risk reduction estimates to account for uncertainties in the analysis because BGE did not submit documentation on the process and assumptions used to develop best-estimate values. The staff included adjustment factors provided by BGE to account for differences in risk contributors between Unit 1 and Unit 2 because these factors led to significantly greater benefits for Unit 2 for certain SAMAs (i.e., those involving improvements to the emergency diesel generators (EDGs) and their support systems). The staff determined these values based on the cost information provided by the applicant (BGE 1998a and 1998c). The staff did not double the benefits associated with APE and AOC, as assumed in BGE's analysis, since these benefits were found to be small relative to other benefits, particularly AOSCs. Procedure improvements were included in the screening and conservatively assigned a zero cost of implementation. The staff identified those SAMAs having a positive net value greater than \$100,000 and compared them to the 13 SAMAs identified by BGE (the 10 having greatest net benefit, plus the three that were still under evaluation at the time the ER was submitted).

The staff's screening identified the same six SAMAs that BGE found cost-beneficial under bounding risk reduction assumptions, and did not identify any hardware changes that were not already included within the set of SAMAs identified by BGE. However, several SAMAs involving procedure improvements were indicated to be cost-beneficial through the staff's screening. These were

- SAMA 35 - Increase/improve DC bus load shedding.
- SAMA 41 - Develop a severe weather conditions procedure.
- SAMA 66a - Enhance procedures to improve flood mitigation guidance.
- SAMA 71 - Enhance procedures for local-manual operation of AFW.
- SAMA 80 - Implement a refueling water storage tank make-up procedure.
- SAMA 82 - Ensure that the plant air compressors are diesel generator backed.

These SAMAs had been separately considered by BGE and eliminated in the final screening because (1) the intent of the SAMA is already addressed by current plant procedures, (2) the improvement assumed in the bounding analysis is not realistically achievable, (3) changes to some of these procedures could increase risk from other contributors, or (4) in the case of flood mitigation procedures,

the procedure change would need to be re-evaluated following disposition of SAMA 66b (implement hardware modifications to prevent flood propagation).

The staff notes that the risk reduction values assumed for these SAMAs in the bounding evaluation were extremely conservative and that the risk reduction that can realistically be achieved is minimal, given that plant procedures are already in place at CCNPP in each of the above areas. The material provided during the January 7, 1999, meeting with BGE (NRC 1999a) documents additional information regarding the current procedures that address these areas. BGE has indicated that the need to modify flood mitigation procedures will be re-evaluated following disposition of SAMA 66-b and revision of the FLOOD module of the CCPRA. Elimination of the other procedure-related SAMAs for the reasons provided by BGE appears reasonable.

Based on review of the screening results, the staff notes the following:

- AOSCs are the single most important factor in the analysis. No SAMAs are cost-beneficial when AOSCs are not included, but several SAMAs are cost-beneficial when AOSCs are included in the analysis in accordance with NUREG/BR-0184.
- Onsite cleanup and decontamination costs typically account for about two-thirds of the total AOSCs, with replacement power costs accounting for the balance. Although replacement power costs represent only one-third of the AOSCs, these costs are still substantial (typically, several hundred thousand dollars after adjustment for frequency for possible cost-beneficial SAMAs). As mentioned above, six SAMAs become cost beneficial when AOSCs (both onsite cleanup and decontamination costs and replacement power costs) are included in the analysis. If only the onsite cleanup and decontamination component of AOSCs is included in the analysis, and replacement power costs are neglected, the net value for several of these SAMAs would remain negative. However, several SAMAs would continue to be cost beneficial under bounding assumptions (SAMA 34, 36, 48a, 49) and best estimate assumptions (SAMA 36, 48a).
- Use of a 3 percent discount rate increases net values, but does not lead to identification of any cost-beneficial SAMAs beyond those already identified by BGE.
- The effect of implementing the SAMA in the near term rather than delaying implementation until the start of the license renewal period (i.e., use of a 35-year rather than a 20-year period in the value impact analysis) is bounded by the sensitivity study that assumed a 3-percent discount rate.

The staff assessed in more detail the six potentially cost-beneficial SAMAs, recognizing the uncertainties inherent in the benefit/cost analysis and the screening nature of the analysis. A summary of this assessment, which was based on both probabilistic and deterministic considerations, follows.

Incorporate an Alternate Battery Charging Capability (34)

This proposed enhancement involves providing a portable diesel-driven generator that could be used to provide battery charging during station blackout conditions. The generator would be connected using the existing plant switchgear for the battery charger via temporary cables; a breaker would be racked out, the power feed to the battery charger would be disconnected, and the diesel generator connected in its place. With implementation of this enhancement, all long-term battery functions would be enhanced if the short-term functions are successful.

Based on the bounding risk-reduction estimate, BGE estimated that this enhancement would result in a 4 percent (1.5×10^{-5} /reactor-year) reduction in total CDF, and a 3 percent (2 person-rem/reactor-year) reduction in offsite dose. This assumes that the 125V bus will be available for 24 hours, given that the 125VDC batteries operate in the short term; loss of offsite power events in excess of 4 hours are eliminated; the likelihood of the 480 VAC buses experiencing common cause failure is significantly reduced; and the benefit is reduced by 20 percent to account for the possible failure of operators to recognize the failure of the installed battery chargers and to manually connect the portable chargers to the affected bus. The licensee's best-estimate risk reduction is approximately half of the bounding value.

The staff agrees that a portable diesel-driven battery charger would significantly enhance the availability of DC power for a longer time. However, batteries alone do not ensure the ability to cope with a long-term station blackout. The continued availability of condensate inventory, compressed air, heating, ventilation, and air conditioning and reactor inventory would also need to be ensured. These aspects would not generally be accounted for in the approach used by BGE to estimate risk reduction, i.e., use of saved sequences. The actual risk reduction would be significantly less than the bounding estimate, and the net value for this SAMA becomes negative when these factors are considered. The staff concludes that this improvement is not warranted because of the practical limitations on the effectiveness of this design improvement, and the relatively small estimated risk reduction that would be achieved under more realistic modeling assumptions.

Replace Batteries with a More Reliable Model (36)

This proposed enhancement involves replacing the existing batteries at CCNPP with new batteries, which are more reliable. With more reliable 125 VDC batteries, the frequency of station blackout and overall plant risk can be reduced.

Based on the bounding risk-reduction estimate, BGE estimated that this enhancement would result in a 9 percent (2.8×10^{-5} /reactor-year) reduction in total CDF, and a 5 percent, 0.036 person-Sv (3.6 person-rem)/reactor-year reduction in offsite dose. This assumes that all short-term battery failures and all 125 VDC bus failures at power are eliminated. The applicant's best-estimate risk reduction is approximately

75 percent of the bounding value. BGE noted that lead-acid batteries have been proven to be one of the most reliable large storage cell designs available; high specific gravity round cells installed at some plants have not proven to be more reliable than lead-acid batteries; and BGE's current requirements for weekly, quarterly, and biennial surveillance ensure an acceptable level of battery reliability.

The staff acknowledges that BGE's risk reduction estimates for this SAMA are appreciable, and that the SAMA has a positive net value under both bounding and best-estimate risk reduction assumptions when AOSCs are included. However, the level of risk reduction assumed in the analysis does not appear to be achievable, given that there are no obvious options that have proven to be more reliable than the currently installed lead-acid batteries. The actual risk reduction may be significantly less than the bounding estimate when these factors are taken into consideration. The staff concurs with BGE's arguments concerning this enhancement, and concludes that implementation of the improvement for license renewal is not warranted because of the practical limitations on its effectiveness and the relatively small estimated risk reduction that would be achieved under more realistic modeling assumptions.

Change Under-voltage, AFAS Block, and High Pressurizer Pressure Actuation Signals to 3-out-of-4 Logic (48a)

This proposed enhancement involves modifying the logic of the Under-Voltage, AFAS block, and High Pressurizer Pressure Actuation signals. The existing engineered safety features actuation system, AFAS, and Pressurizer Pressure logic modules, which are based on 2-out-of-4 logic, would be replaced with new modules based on 3-out-of-4 logic. This modification would prevent an SSSA, which is one of the most risk-significant contributors in the CCPRA model. The change to a 3-out-of-4 logic offers an advantage of preventing a spurious actuation upon failure of 2 channels in the tripped condition, but has the disadvantage of preventing actuation if 2 channels fail in the untripped condition. In either case, the system will perform correctly with a single failure.

The staff notes that the current CCNPP design meets the single failure criteria and that licensed operators at CCNPP have received training (including simulator training) in the appropriate response to an SSSA event. However, based on the bounding risk-reduction estimate, BGE estimated that this enhancement would result in a 30 percent ($9.1\text{E-}5/\text{reactor-year}$) reduction in total CDF, and a 17 percent, 0.11 person-Sv (11 person-rem)/reactor-year reduction in offsite dose. This estimate conservatively assumes that all failures of 120V vital AC panels, 125 VDC buses, and operator actions to align inverters to back-up power are eliminated. The licensee's best-estimate risk reduction is approximately one-third of the bounding value. The SAMA has a positive net value under both bounding and best-estimate risk reduction assumptions when AOSCs are included.

Although predicted to offer a significant risk reduction, the implementation of the SAMA may reduce the ability of the trip system to respond correctly with two failures, or a bypass and a failure. BGE appears to have considered this concern, as indicated by their statement that the risk benefit to be achieved by

preventing this event from occurring exceeds the risk benefit to be expected from modifying the actuation logic, but further review would be required. The NRC would require additional justification and regulatory review to ensure that this change in logic will not unacceptably reduce the ability of the trip system to respond correctly. BGE notes that implementation of this change is expected to involve a 10 CFR 50.59 evaluation, an Unreviewed Safety Question submittal (USQ), and a revision to the CCNPP technical specifications. An estimate of the regulatory costs (\$100,000) was included in the estimated cost of this SAMA, but the actual costs could vary significantly.

Although this SAMA appears to be cost beneficial, it does not relate to adequately managing the effects of aging during the period of extended operation and therefore, will not need to be implemented as part of license renewal pursuant to 10 CFR Part 54.

Add Automatic Bus Transfer Feature to Transfer Between Either the Back-up Bus or the Standby Inverter on the Failure of the Operating Inverter (49)

Upon failure of two 120 VAC vital panels, all engineered safety features actuation system, AFAS, and reactor protection system actuation modules trip. Tripping of these modules could lead to the risk-significant SSSA scenario discussed above. This SAMA involves the addition of an automatic transfer switch (ATS) feature that would automatically transfer between either the back-up bus or the standby inverter upon the failure of the operating inverter. This would minimize the potential for loss of power from a 120 VAC vital panel, and thereby reduce the frequency of the SSSA scenario.

While an ATS feature minimizes the loss of power to two 120 VAC vital panels, thereby reducing the CDF from SSSA scenarios, it also has some disadvantages. One disadvantage of an ATS feature is if failure of the operating inverter is caused by a fault on the bus or on the bus load side circuitry, placing the back-up inverter on the same bus could result in damage or failure of the back-up inverter. Another disadvantage is the potential for a failure of the ATS feature that could result in loss of both inverters. Measures must be taken for the circuitry and hardware designs along with the installation of an ATS feature to ensure that these disadvantages are adequately addressed.

The staff notes that the current CCNPP design meets the single-failure criteria and applicable regulations regarding loss of vital AC, and that loss of power from two 120 VAC vital panels is beyond the design and licensing bases for the plant. Furthermore, the licensed operators at CCNPP have received training in the appropriate response to an SSSA event.

BGE estimated the risk reduction potential for SAMA 49 using the same assumptions used for evaluating SAMA 48a, since both SAMAs address the same scenario (i.e., an SSSA scenario). Use of benefit estimates for SAMA 48a is conservative since these benefit estimates do not account for potential failure mechanisms for the ATS. Under bounding assumptions, this enhancement would result in a 30 percent (9.1×10^{-5} /reactor-year) reduction in total CDF, and a 17 percent, 0.11 person-Sv (11 person-rem)/reactor-year reduction in offsite dose. Under best-estimate assumptions, the risk reduction

- | is approximately one-third of the bounding value. When AOSCs are included, the SAMA has a positive net value under bounding risk reduction assumptions, but a negative net value under best-estimate risk reduction assumptions. (In the latter case, the net value for Unit 2 is slightly positive, but is offset by a larger negative net value for Unit 1.) Based on the above, implementation is not warranted.

Automate Demineralized Water Make-Up to Condensate Storage Tank (74)

- | This proposed enhancement involves modifying the DW make-up to CST 12 such that it automatically makes up on the low water level in the tank, and providing a dedicated non-safety related electric diesel generator, which would automatically start and supply power to the make-up pump and associated control valves. This enhancement will improve the reliability of make-up to the service water and component cooling water head tanks (by making the demineralized water transfer pumps diesel-backed), and eliminate operator actions to align a long-term AFW supply (by designing the demineralized water make-up to automatically open on low water level in CST 12).

Based on the bounding risk-reduction estimate, BGE estimated that this enhancement would result in a 5 percent (1.7×10^{-5} /reactor-year) reduction in total CDF, and a 3 percent, 0.02 person-Sv (2 person-rem)/reactor-year reduction in offsite dose. This conservatively assumes that long-term AFW water supply, as well as service water and component cooling water head tank make-up, are always successful. The licensee's best-estimate risk reduction is approximately 60 percent of the bounding value. This SAMA has a positive net value under both bounding and best-estimate risk reduction assumptions when AOSCs are included.

- | The staff acknowledges that this enhancement has a positive net value; however, it does not relate to adequately managing the effects of aging during the period of extended operation and therefore, will not need to be implemented as part of license renewal pursuant to 10 CFR Part 54.

Increase PORV Size So That Only One PORV is Required for Successful Feed-and-Bleed (77)

This proposed enhancement involves replacing the existing PORVs, block valves, and associated discharge piping, such that only a single PORV is required to provide adequate decay heat removal. This would substantially improve the reliability of feed-and-bleed cooling since only 1-of-2 rather than 2-of-2 PORVs would be required for success. A similar modification was made to the Palisades plant in 1989, at a cost of \$2.7 million, and was used as the basis for BGE's cost estimates for this SAMA.

Based on the bounding risk-reduction estimate, BGE estimated that this enhancement would result in a 46 percent (1.5×10^{-4} /reactor-year) reduction in total CDF, and a 45 percent, 0.31 person-Sv (31 person-rem)/ reactor-year reduction in offsite dose. This benefit is based on the conservative assumption that all AFW hardware and human-action-related failures are eliminated. The licensee's best-estimate risk reduction is approximately half of the bounding value.

The SAMA has a positive net value under bounding risk reduction assumptions when AOSCs are included. However, the level of risk reduction assumed in the bounding case does not appear to be achievable, given that all AFW hardware and human-action-related failures would not realistically be eliminated through this change. In this regard, BGE's best estimate of risk reduction appears more representative of the level of risk reduction that might be achieved. Under best-estimate risk reduction assumptions, the SAMA has a negative net value, even when AOSCs are included.

5.2.7 Conclusions

BGE completed a comprehensive effort to identify and evaluate potential cost-beneficial plant enhancements to reduce the risk associated with severe accidents at CCNPP. As a result of this assessment, BGE identified and committed to pursue one enhancement in accordance with the CCNPP modification process. This involves the installation of a watertight door between the service water pump room and the adjacent fan room to reduce the likelihood of core damage from internal flooding events. BGE also committed to further evaluate the adequacy of CCNPP procedures regarding response to internal floods following resolution of the hardware flooding enhancement. BGE concluded that no additional mitigation alternatives are cost-beneficial and warrant implementation at CCNPP.

Based on the staff's review of SAMAs for CCNPP, several SAMAs appear to be cost-beneficial when evaluated using the guidance in NUREG/BR-0184 (NRC 1997b). Three SAMAs (36, 48a, and 74) have a positive net value under both bounding and best-estimate risk reduction assumptions when AOSCs are included. The most risk-significant enhancement, SAMA 48a, has a CDF reduction of approximately 30 percent under bounding assumptions, and 10 percent under best-estimate assumptions. All remaining SAMAs have either a very small negative net value, or offer minimal risk reduction (i.e., a reduction of only a few percent) under best estimate risk reduction assumptions.

Although a limited number of SAMAs (four) appear to be cost beneficial and to offer a level of risk reduction, those 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.

5.3 References

10 CFR 50.59, "Changes, tests, and experiments."

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.53, "Postconstruction environmental reports."

Postulated Accidents

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effect of renewing the operating license of a nuclear power plant."

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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 were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437 (NRC 1996). The GEIS included 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 were 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 offsite 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

This chapter addresses those issues that are related to the uranium fuel cycle and solid waste management during the license renewal term, listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, and are applicable to CCNPP. The generic potential radiological and non-radiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based 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 Reactor." The GEIS also addresses the impacts from radon and technetium. With the exception of transportation of high-level waste, all aspects of the impacts from the uranium fuel cycle and solid waste management are Category 1 issues.

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 CCNPP uranium fuel cycle and solid waste management are listed in Table 6-1. BGE stated in its
- | Environmental Report (ER) that it is unaware of any new and significant information related to these

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

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
URANIUM FUEL CYCLE AND WASTE MANAGEMENT	
Offsite 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
Offsite radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4
Offsite radiological impacts (spent fuel and high level waste disposal)	6.1; 6.2.2.1; 6.2.3; 6.2.4
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
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
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

Category 1 issues. No significant new information has been identified by the staff in the review process and in the staff's independent review. Therefore, the staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.^(a) For all of those issues, the GEIS concluded that the impacts are SMALL, and plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

- Offsite 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no offsite radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.
- Offsite 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 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 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

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

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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no collective impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Offsite 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 offsite 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 [INS 1995]," 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 3×10^{-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 [DOE 1980]," October 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 high level waste 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 the 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 worldwide for a 100,000 metric tonne (MTHM) 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 significance for the impacts of spent fuel and high level waste disposal, this issue is considered Category 1."

The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of spent fuel and high level waste 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 NRC decommissioning requirements." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 NRC decommissioning requirements." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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.
- Onsite spent fuel: Based on information in the GEIS, the Commission found that "The expected increase in 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 onsite spent fuel impacts were determined to be SMALL. The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 nonradiological waste impacts were determined to be SMALL. The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

- **Transportation:** Subsequent to the issuance of the draft SEIS, the Commission promulgated a final rule to amend the regulations governing the transportation issues of the environmental review requirements for renewal of nuclear power plant operating licenses. This transportation issue had been considered a Category 2 issue and was discussed in Section 6.1.1 of the draft SEIS. It is no longer considered a Category 2 issue and, therefore, Section 6.1.1 has been deleted. 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 NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste 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."

The transportation impacts were determined to be SMALL if fuel enrichment and burnup conditions set forth in the Addendum 1 to the GEIS are met. CCNPP meets the fuel enrichment and burnup conditions. The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

6.2 References

10 CFR 51.23, "Temporary storage of spent fuels after cessation of reactor operation—generic determination of no significant environmental impact."

10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data."

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 Reactor."

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effects of renewing the operating license of a nuclear power plant."

10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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

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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*. NUREG-1437, Volume 1, Addendum 1. Washington, D.C.

7.0 Environmental Impacts of Decommissioning

Environmental issues associated with decommissioning resulting from continued plant operation during the renewal term were discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants* (GEIS), NUREG-1437 (NRC 1996). The GEIS included 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 were then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS (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 offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel)
- (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 not likely 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 of Category 1, and therefore, additional plant-specific review for these issues is required.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to CCNPP decommissioning following the renewal term are listed in Table 7-1. BGE stated in its Environmental Report (ER) that it is unaware of any new and significant information related to these Category 1 issues. No significant new information has been identified by the staff in the review process and in the staff's independent review. 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 plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

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

Table 7-1. Category 1 Issues Applicable to the Decommissioning of the CCNPP Following the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
DECOMMISSIONING	
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

- **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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no radiation doses associated with decommissioning following license renewal 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of license renewal on air quality during decommissioning 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." The staff has not identified any significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of the license renewal term on water quality during decommissioning 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of the license renewal term on ecological resources during decommissioning 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 significant new information during its independent review of the BGE ER, the staff's site visit, the scoping process, its review of public comments on the draft SEIS, or its evaluation of other available information. Therefore, the staff concludes that there are no impacts of license renewal on the socioeconomic impacts of decommissioning beyond those discussed in the GEIS.

7.1 References

10 CFR Part 51, Subpart A, Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant."

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

8.0 Environmental Impacts of Alternatives to License Renewal

The planning for electric power generation in Maryland is accomplished by three groups interacting with each other: (1) power generators (such as BGE), (2) the Maryland Public Service Commission (PSC), and (3) the Maryland Power Plant Research Program within the Maryland Department of Natural Resources (MDNR). The Public Service Commission regulates electric power rates and other practices of the individual utilities under their purview. The Power Plant Research Program is required by State law to review and evaluate the impacts to Maryland's environment from the construction and operation of electric power generation and transmission systems (MDNR 1999a). The Power Plant Research Program summarizes these impacts biennially and advises the PSC on the environmental impacts of utility proposals.

This chapter examines the potential environmental impacts associated with denying a renewed license (i.e., the No-Action alternative); the potential environmental impacts from electric generating sources other than nuclear license renewal; the potential impacts from instituting additional conservation measures to reduce the total demand for power; and the potential impacts from power imports. The impacts are evaluated using a three-level standard of significance—small, moderate, or large—based on Council on Environmental Quality (CEQ) guidelines. These significance levels are

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.

8.1 No-Action Alternative

For license renewal, the No-Action alternative refers to a scenario in which NRC would not renew the CCNPP operating licenses, and the applicant would then decommission CCNPP when plant operations cease. Replacement of CCNPP electricity generation capacity would be met either by demand-side management and energy conservation (perhaps supplied by an energy service company), imported power, or by some in-State generating alternative other than CCNPP. However, due to the influence of the ongoing deregulation of the retail market, BGE may not be the ultimate supplier of power.

In April 1999, the Maryland General Assembly approved the Electric Customer Choice and Competition Act of 1999, signed into law by the governor shortly thereafter. During the past year, BGE and other parties (including DNR) have been litigating a transition to retail competition.

Restructuring means that CCNPP will no longer be required to serve its Maryland customers (except perhaps in the early years of restructuring when BGE retains a "default" of Standard Offer obligation). As a general matter, in a restructured world, CCNPP will serve the regional, mid-Atlantic market. However, due to transmission constraints for imports into Maryland, if CCNPP were to be retired, either some of the replacement capacity must be sited in Maryland, or transmission intertie transfer capacity must be expanded to allow more imports. Although Maryland would need either replacement capacity or expanded transmission capability if CCNPP is retired, the new resources need not be sited in Southern Maryland (i.e., near the present CCNPP site). This is because there is already substantial generation in Southern Maryland at Potomac Electric Power Company's (PEPCO) Morgantown and Chalk Point Plants. Maryland load centers are primarily north of the CCNPP site. Ultimately the retirement of CCNPP will necessitate replacement resources in the form of new generation and/or transmission in Maryland; it will be supplied by the market, not necessarily BGE (MDNR 1999b).

BGE will be required to comply with NRC decommissioning requirements whether or not the licenses are renewed. If the CCNPP operating licenses are renewed, decommissioning activities may be postponed for up to an additional 20 years. If the licenses are not renewed, then BGE would begin decommissioning activities when plant operations cease, beginning in 2014 or perhaps sooner. The impacts of decommissioning will occur concurrently with the impacts of supplying replacement power. The GEIS (NRC 1996), and the *Final Generic Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586 (NRC 1988) provide a description of decommissioning activities.

The environmental impacts associated with decommissioning under the No-Action alternative would be bounded by the discussion of impacts in Chapter 7 of the GEIS, Chapter 7 of the SEIS, and NUREG-0586. The impacts of decommissioning after 60 years of operation generally would not be significantly different from those occurring after 40 years of operation.

When CCNPP ceases operation, there will be a decrease in employment and tax revenues associated with the closure. This impact would be concentrated in Calvert County, and to a lesser degree in St. Mary's, Charles, and Ann Arundel Counties. Most secondary employment impacts and impacts on population would also be expected in these counties. Table 2.6 shows the current geographic distribution of the residences of CCNPP employees by county. Most of the tax revenue losses would occur in Calvert County.

Additionally, the potential for future adverse impacts to known or unrecorded cultural resources at the CCNPP following decommissioning will depend on the future land use of the site. Known resources and activities include the current visitors center, historic properties, and associated interpretative efforts

that are funded and maintained by BGE. Eventual sale or transfer of the land within the plant site could result in adverse impacts to these resources, should the land-use pattern change dramatically.

Current operations at CCNPP do not have disproportionate impacts on low-income and minority populations of the surrounding counties, and no environmental pathways have been identified that would cause disproportionate impacts. Since closure would result in a decrease in employment and tax revenues in Calvert County, it is possible that the County's ability to maintain social services could be reduced at the same time as diminished economic conditions reduce employment prospects for the minority or low-income populations. There is some possibility of negative and disproportionate impacts on minority or low-income populations from this source under the No-Action Alternative.

The No-Action alternative results in these impacts occurring 20 years earlier than if the licenses are renewed (Table 8-1).

Table 8-1. Summary of Environmental Impacts from No-Action Alternative

Impact Category	Impact	Comment
Socioeconomic	MODERATE to LARGE	Decrease in employment and tax revenues ^(a)
Archaeological and Historic Resources	SMALL to LARGE	Sale or transfer of land within plant site leads to changes in land use pattern
Environmental Justice	SMALL to MODERATE	Loss of employment opportunities and social programs

(a) Recent Maryland utility tax legislation will reduce the property tax revenues substantially on a phased-in basis. In any event, CCNPP property tax revenues are expected to decline over time by 60 percent, partially offset by State compensation.

8.2 Alternative Energy Sources

Nuclear power plants are commonly used for base-load generation; the GEIS indicates that coal-fired and gas-fired generation capacity are the feasible alternatives to nuclear power generating capacity, based on current (and expected) technological and cost factors. The alternatives of coal-fired generation and gas-fired generation are presented (Sections 8.2.1 and 8.2.2, respectively) as if such plants were constructed at the CCNPP site, using the existing water intake and discharge structures, switchyard, and transmission lines, or at an alternate location, which could be either a current industrial site or an undisturbed, pristine site requiring a new generating building and facilities, new switchyard, and at least some new transmission lines. For the purposes of this SEIS, a "greenfield" site is assumed to be an undisturbed, pristine site.

Depending on the location of an alternative site, it might also be necessary to provide a connection to the nearest gas pipeline (in the case of natural gas) or rail connection (in the case of coal). The requirement for these additional facilities also likely would increase the environmental impacts relative to those that would be experienced at the CCNPP site, although this is less certain.

The cooling water needs of a fossil fuel-fired plant of equal capacity to the CCNPP facility would require the use of either a once-through cooling system located on a large body of water such as the Chesapeake Bay or a closed-cycle system using cooling towers.

The potential for using imported power is discussed in Section 8.2.3. Imported power is considered feasible, but would result in the transfer of environmental impacts from the current region in Maryland to some other location in Maryland, another state, or a Canadian province. Several other technologies were considered, but were determined not to be reasonable replacements for a nuclear power plant. These options included wind, solar, hydropower, geothermal, wood energy, municipal solid waste, oil, advanced nuclear, delayed retirement of other generating units, utility-sponsored conservation, and fuel cells, and these are discussed in Section 8.2.4.

Some of the alternatives in this section are not inherently infeasible, but could not provide enough power to replace CCNPP on their own. The final subsection considers the environmental consequences of a mix of alternatives. In general, these impacts are larger than the environmental consequences of relicensing.

8.2.1 Coal-Fired Generation

In its Environmental Report (ER) related to renewal of CCNPP (BGE 1998a), BGE used information about the Delmarva Power and Light Company's Dorchester Power Plant and the South Carolina Electric and Gas Company's Cope Power Plant to develop a representative alternative coal-fired plant. For some plant characteristics, the data were referenced directly; in other cases, BGE appropriately scaled data to fit the size plant needed for a CCNPP-alternative energy source. The staff has reviewed the description and considers that it reasonably represents the type of technology that would be used.

BGE assumed that it would require 1800 MW coal-fired generation capacity to replace the 1690-MW capacity of CCNPP. The larger-sized coal-fired facility would be necessary to offset increased electrical usage for pollution control, pumping water for cooling, or transporting coal or ash.

8.2.1.1 Once-Through Cooling System

The coal-fired alternative described by BGE in the ER (BGE 1998a) consists of three (600-MW) units that would burn pulverized bituminous coal. The units would be constructed at the same time with phased-in service dates to replace the power demands supplied by CCNPP and would have an operational life of 40 years (South Carolina Electric and Gas Co. 1991). Constructing a larger number

of smaller units instead of three (600-MW) units would offer no known environmental benefits. A maximum of 13,900 metric tonnes (MT) (15,300 tons) of coal and 760 MT (840 tons) of lime/limestone per day would be delivered by barge to the existing plant dock. Coal is assumed to have a heating value of 30,000 Joule/kilogram (J/kg) (13,000 BTU per pound) and ash content of 10 percent. The sulfur content of the coal would be 0.8 percent.

The following discusses the environmental impacts of converting the current CCNPP site to a coal-fired generation facility and building a similar facility on a greenfield site. The impacts are summarized in Table 8-2.

- **Land Use:** The coal-fired generation alternative would necessitate converting roughly an additional 360 ha (900 acres) of the 2108-acre CCNPP site to industrial use (plant, coal storage, and ash and scrubber sludge disposal), expanding the altered area at the site from 90 ha (220 acres) to 450 ha (1120 acres). Currently, this land is open space, some of it is farmed, and the rest is a revegetated dredged spoils disposal area known as Lake Davies. Facilities would also need to be constructed to control and treat leachate from coal storage areas, and ash and scrubber waste disposal areas. The existing switchyard and transmission system would be used. It is assumed that coal-fired generation structures and facilities, including coal storage and waste disposal, would be located in one or more of the CCNPP site open areas. BGE indicated that the power block and coal pile alone would occupy approximately 120 ha (300 acres). Approximately 240 ha (600 acres) (South Carolina Electric and Gas Co. 1991) would be used to dispose of 1.4 million MT (1.5 million tons) of waste per year (ash and scrubber sludge) produced during a 40-year plant lifetime. In contrast, the GEIS estimate for constructing a 1000-MW coal plant at a new site would require approximately 700 ha (1700 acres), almost twice as much land.

Converting 360 ha (900 acres) onsite from agricultural and revegetated spoil disposal land to industrial use would be a detectable change that would noticeably alter the present land-use pattern. Although agricultural usage would be eliminated at the site, site agricultural lands are not unique in the region, and eliminating agriculture at the CCNPP site should not affect offsite agricultural land use. Almost 400 ha (1000 acres) of the site's natural habitat would remain unaffected by the construction, and no important attribute would be destabilized. The impact of coal-fired generation on land use is best characterized as MODERATE; its impact would be greater than the proposed action.

In contrast, land use for a coal-fired generation alternative using once-through cooling at an alternative greenfield site would require an additional 60 ha (150 acres) for offices, roads, parking areas, and a switchyard. This is in addition to the 360 ha (900 acres) discussed previously. An additional 170 ha (424 acres) would be needed for transmission lines (assuming the plant is sited 16 km [10 miles] from the nearest intertie connection), for a total of approximately 600 ha (1500 acres). Depending on transmission line routing, these alternatives could result in

MODERATE or LARGE land-use impacts consistent with the GEIS characterization of land use at a greenfield site.

Table 8-2. Summary of Environmental Impacts from Coal Alternative—Once-Through Cooling

Impact Category	Calvert Cliffs Site		Alternate "Greenfield" Site	
	Impact	Comments	Impact	Comments
Land Use	MODERATE	Uses another 360 ha (900 acres) of CCNPP site	MODERATE to LARGE	600 ha (1500 acres) including transmission lines
Ecology	SMALL	Use of previously disturbed areas	MODERATE to LARGE	Impact will depend on ecology of site
Water Use and Quality:				
- Surface Water	SMALL	<ul style="list-style-type: none"> • Uses existing intake and discharge structures • Volume and temperature rise the same 	SMALL to MODERATE	Impact will depend on volume and other characteristics of receiving water
- Groundwater	LARGE	<ul style="list-style-type: none"> • Increases groundwater usage to 0.13 m³/s (3 million gpd) • Increase could destabilize resource 	SMALL to LARGE	Impact will depend on site characteristics and availability of groundwater
Air Quality	MODERATE	<ul style="list-style-type: none"> • Sulfur oxides <ul style="list-style-type: none"> – 3250 MT (3600 tons)/yr – allowances required • Nitrogen oxides <ul style="list-style-type: none"> – 1525 MT (1680 tons)/yr – allowances required • Particulate <ul style="list-style-type: none"> – 210 MT (234 tons)/yr filterable – 50 MT (54 tons) PM₁₀ • Carbon monoxide <ul style="list-style-type: none"> – 1060 MT (1170 tons)/yr • Mercury <ul style="list-style-type: none"> – small emissions 	MODERATE	Same impacts as Calvert Cliffs site, although pollution control standards may vary
Waste	MODERATE	1.4 million MT (1.5 million tons)/yr fly ash and scrubber sludge	MODERATE	Same impacts as Calvert Cliffs site; waste disposal constraints may vary
Human Health	SMALL	Impacts considered minor	SMALL	Same impact as Calvert Cliffs site
Socioeconomics	MODERATE	1500 to 2000 additional workers during 5-year construction period, followed by reduction from current 1550 to 220 persons	MODERATE	Construction impacts would be relocated. Community near CCNPP would still experience reduction from 1550 persons to 220 persons
Aesthetics	MODERATE to LARGE	Visual impact of large industrial facility and stacks would be significant	MODERATE to LARGE	Alternate locations could reduce aesthetic impact if siting is in an industrial area
Archeological and Historical Resources	SMALL	Only previously disturbed areas would be affected	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Impacts on housing are likely.	SMALL to LARGE	Impacts will vary depending on population distribution and make up

- **Ecology:** Locating an alternate energy source at the existing CCNPP site should not noticeably alter ecological resources due to the use of previously disturbed areas and the existing intake and discharge system. Important CCNPP site ecological resources, such as the special-status species (discussed in Sections 2.2.5 and 2.2.6), would not be expected to be significantly affected, and approximately 400 ha (1000 acres) of natural habitat at the site would remain untouched by construction. The impact to the Chesapeake Bay ecology would be expected to remain unchanged because the once-through cooling system at CCNPP has not shown significant negative impact to the Bay. The appropriate characterization of coal-fired generation ecological impacts of the CCNPP site would be SMALL.

Constructing a coal-fired plant at a greenfield site, particularly one sited in a rural area with considerable habitat, would certainly alter the ecology and could impact any endangered or threatened species present at the site. These ecological impacts could be MODERATE to LARGE consistent with the GEIS characterization of ecological impacts at a greenfield site.

- **Surface Water Use and Quality:** The coal-fired generation alternative is assumed to use the existing CCNPP intake and discharge structures as part of a once-through cooling system. This alternative would minimize environmental impacts since minimal construction would be required to adapt the system to the coal-fired alternative. It is assumed that the coal-fired alternative cooling water volume and temperature rise would be approximately the same as for the current nuclear plant (i.e., 140 m³/s [3200 million gpd] with a 7°C [12°F] temperature rise). This temperature rise would comply with the existing CCNPP National Pollutant Discharge Elimination System (NPDES) permit (MDE 1994). Surface water quality would also be affected by the need for routine maintenance dredging at the existing barge dock to support daily barge traffic. Best management practices required by the County Erosion and Sediment Control Ordinance would minimize erosion and sedimentation that would be expected from land-clearing activities. The GEIS analysis determined that surface water quality, hydrology, and use impacts for license renewal would be SMALL. Because the coal-fired generation alternative is assumed to have the same discharge characteristics as CCNPP, and maintenance dredging impacts would be temporary and localized, surface water impacts are expected to remain SMALL; the impacts would be so minor that they would not noticeably alter any important attribute of the resource.

For alternative greenfield sites, the impact to the surface water would depend on the volume associated with the cooling system and characteristics of the receiving body of water. The impacts would be SMALL or MODERATE.

- **Groundwater Use and Quality:** The reduced workforce size (1550 for two nuclear unit operation to an estimated 220) would reduce groundwater withdrawals for potable water use, but additional withdrawals would be needed for wet-scrubber sulfur oxides emissions control and boiler makeup. Maximum groundwater consumption is assumed to be 0.05 m³/s per unit (800 gpm or 1,152,000 gpd). This would exceed the amount authorized by the current groundwater allocation permit.

Leachate from coal storage areas and ash and scrubber waste disposal areas would have to be controlled to avoid groundwater contamination.

The GEIS did not address groundwater impacts from coal-fired generation. However, groundwater withdrawals in Calvert and St. Mary's Counties by public water supply systems, such as Lexington Park, and the Patuxent River Naval Air Station is of some concern in the region. The coal-fired generation alternative would increase the site groundwater use from a current average 0.017 m³/s (392,000 gpd) to a potential maximum of more than 0.13 m³/s (3,000,000 gpd). This would significantly exceed the current site's groundwater allocation permit of 0.02 m³/s (450,000 gpd). Such an increase would noticeably alter the site's impact on groundwater resources. It might be sufficient to destabilize the resource due to the volume of groundwater available. For these reasons, the appropriate characterization of coal-fired generation groundwater impacts would be LARGE.

For alternative greenfield sites, the impact to the groundwater would depend on the site characteristics, including the amount of groundwater available. The impacts would range between SMALL and LARGE.

- **Air Quality:** BGE assumed that each of the three units could be 60-m (200-feet) tall, would be tangentially fired, dry-bottom boilers, and would include an approximately 180-m (600-foot) high stack. This firing configuration was chosen because it would have moderate uncontrolled emissions of nitrogen oxides (NO_x) compared with other applications. NO_x emissions controls would include low NO_x burners, overfire air, and post-combustion selective catalytic reduction. The combination of low NO_x burners and overfire air would achieve a NO_x reduction of 40 to 60 percent from uncontrolled levels. These combustion controls, along with selective catalytic reduction, can achieve the current upper limit of NO_x control (95 percent reduction). Based on an operating capacity factor of 83.9 percent, the resulting annual NO_x emissions would be approximately 510 MT (560 tons) per unit (EPA 1993; Delmarva Power and Light Co. 1992). Each unit would have fabric filters or electrostatic precipitators (99.9 percent particulate removal efficiency) and a wet lime/limestone flue gas de-sulfurization system (95 percent scrubber removal efficiency). Based on an operating capacity factor of 83.9 percent, the resulting annual emissions per unit would be 71 MT (78 tons) of filterable particulates, 16 MT (18 tons) of particulate matter having a diameter of 10 microns or less (PM₁₀), and 1090 MT (1200 tons) of sulfur oxides (SO_x). Carbon monoxide emissions would be approximately 350 MT (390 tons) per year per unit (EPA 1993; Delmarva Power and Light Co. 1992).

Air quality impacts of coal-fired generation vary considerably from those of nuclear power due to emissions of SO_x, NO_x, particulates, and CO. The air quality impacts would be considered MODERATE for coal-fired generation. The impacts would be clearly noticeable, but would not destabilize air quality. The following discussion of SO_x and NO_x emission regulatory provisions is taken from the BGE Integrated Resource Plan (IRP) (BGE 1995).

The impacts at a greenfield site would be similar to those at the CCNPP site, although pollution control standards may vary. Therefore, the impacts would be MODERATE.

Sulfur oxides emissions: Using current SO_x emissions control technology, the total annual stack emissions would include approximately 3250 MT (3600 tons) of SO_x, most of which would be sulfur dioxide (SO₂). Additional reductions could become necessary. The acid rain provision of the Clean Air Act (CAA) (Sections 403 and 404) capped the nation's SO₂ emissions from power plants. Under the CAA, affected fossil fuel-fired steam units are allocated a number of SO₂ emission allowances. To achieve compliance, each utility must hold enough allowances to cover its SO₂ emissions annually or be subject to certain penalties. If the utility's SO₂ emissions are less than its annually allocated emission allowances, then the utility may bank the surplus allowances for use in future years. A SO₂ allowances market has been established for the buying and selling of allowances. BGE has SO₂ allowances that it anticipates will last until 2002 for its existing coal-fired units. To operate a coal-fired generation alternative beginning in 2014, however, BGE would have to purchase additional allowances or further reduce SO₂ emissions at existing coal-fired plants. BGE could achieve further reductions by shutting other plants, by lowering coal sulfur content (e.g., pre-combustion cleaning), or by increasing emissions removal efficiency at existing plants. Because of allowances, any major new combustion facility in Maryland would not add SO₂ impacts on a regional basis, though it might do so locally.

Nitrogen oxides emissions: Using currently available control technology, the total annual NO_x emission would be approximately 1525 MT (1680 tons). Section 407 of the CAA establishes an annual NO_x emissions reduction program. In addition, provisions in the Northeast Ozone Transport Region, authorized by Section 184(a) of the CAA, are more stringent. The current, reasonably available control technology (RACT) is not expected to achieve the ambient ozone standard (40 CFR 50.9, 50.10), and further regional NO_x reductions would be necessary. To implement a coal-fired alternative, BGE would be required to offset its corporate NO_x emissions through further reductions in NO_x emissions elsewhere, by shutting other sources down, or by backfitting to reduce NO_x formation (e.g., installing over-fired air, low NO_x burners, flue gas recirculation, and selective non-catalytic and catalytic reduction systems). Alternatively, offsets might be available for purchase on the open market. A major new combustion facility would not add to net regional emissions, though it might do so locally.

Particulate emissions: The total estimated annual stack emissions would include 210 MT (234 tons) of filterable particulates and 50 MT (54 tons) of particulate matter having a diameter of 10 microns or less (PM₁₀). In addition, coal handling equipment would introduce fugitive particulate emissions.

Carbon monoxide emissions: The total CO emissions would be approximately 1060 MT (1170 tons) per year. The GEIS analysis did not quantify coal-fired emissions, but implied that air impacts would be substantial and mentioned global warming and acid rain as potential impacts. Adverse human health effects from coal combustion have led to important Federal legislation in recent years, and

public health risks, such as cancer and emphysema, have been associated with the products of coal combustion. Federal legislation and large-scale concerns, such as acid rain and global warming, are indications of concerns about air resources. SO₂ emission allowances, NO_x emission offsets, low NO_x burners, overfire air, selective catalytic reduction, fabric filters or electrostatic precipitators, and scrubbers may be required as mitigation measures.

Mercury: Coal-fired boilers account for nearly a third of mercury emissions in the United States. Technologies available to control mercury emissions have varying degrees of success. In response to growing concerns with mercury, the CAA has required the EPA to identify mercury emission sources, evaluate the contributions of power plants and municipal incinerators, identify control technologies, and evaluate the toxicological effects of eating mercury-contaminated fish. It is likely that these studies will lead to additional restrictions concerning mercury emissions associated with coal-fired power plants, as well as other sources of mercury emissions. The Maryland Power Plant Research Program's recent studies have indicated that although coal-fired power plants contribute to mercury emissions, the resulting concentrations are not high enough to adversely affect humans or other organisms. Therefore, the probable effect of mercury emissions on human health would be SMALL.

- Waste: Coal combustion generates waste in the form of ash, and air pollution control equipment generates additional ash and scrubber sludge. Approximately 1.4 million MT (1.5 million tons) of this waste would be generated annually for 40 years and disposed of onsite, accounting for 240 of the 360 ha (600 of the 900 acres) of land-use. While only half of these values are directly attributable to the alternative to a 20-year CCNPP license renewal, the total values are pertinent as a cumulative impact. This impact could extend well after the 40-year operation life because revegetation management and groundwater monitoring for leachate contaminant impacts could be a permanent requirement.

The GEIS analysis noted that large amounts of fly ash and scrubber sludge would be produced and would require constant management. BGE agrees that disposal of this waste could noticeably affect land use and groundwater quality, but believes that, with appropriate management and monitoring, it would not destabilize any resources. After closure of the waste site and revegetation, the land would be available for other uses, and regulatory requirements would ensure groundwater protection. For these reasons, the appropriate characterization of coal-fired generation waste impacts would be MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

Siting the facility on an alternate greenfield site would not alter waste generation, although other sites might have more constraints on disposal locations. Therefore, the impacts would be MODERATE.

- **Human Health:** Coal-fired power generation introduces worker risks from fuel and lime/limestone mining, and worker and public risks from fuel and lime/limestone transportation and stack emissions inhalation. Stack impacts can be very widespread and health risks difficult to quantify. This alternative also introduces the risk of coal-pile fires and attendant inhalation risks.
- The GEIS analysis noted that there could be human health impacts (cancer and emphysema) from inhalation of toxins and particulates, but did not identify the significance of this impact. Regulatory agencies, such as the EPA and the Maryland Department of the Environment (MDE), focus on air emissions and revise regulatory requirements, or propose statutory changes, based on human health impacts. Such agencies also impose site-specific emission permit limits as needed to protect human health. Thus, coal-fired generation human health impacts would be SMALL.

Siting the facility at an alternate greenfield site would not alter the expected human health effects. Therefore, the impacts would be SMALL.

- **Socioeconomics:** Construction of the coal-fired alternative would take approximately 5 years. It is assumed that construction would take place concurrently while CCNPP continues operation and would be completed at the time CCNPP would halt operations. BGE estimated the workforce would be expected to average 1500 with a peak of 2000 additional workers during the 5-year construction period. The surrounding communities would experience demands on housing and public services that could have large impacts. After construction, the communities would be impacted by the loss of jobs; construction workers would leave, the nuclear plant workforce (1550) would decline through a decommissioning period to a minimal maintenance size, and the coal-fired plant would introduce only 220 new jobs.

The GEIS analysis noted that socioeconomic impacts at a rural site would be larger than at an urban site because more of the estimated 1200-2500 peak construction workforce would need to move to the area to work. Operational impacts could result in moderate socioeconomic benefits in the form of several hundred additional jobs, substantial tax revenues, and plant expenditures.

The size of the coal-fired generation construction workforce and plant-related spending during construction would be noticeable. However, due to the site's proximity to large labor pools in the Washington, D.C., and Baltimore areas, BGE would not expect construction workers to move to the CCNPP area. Operational impacts would include an eventual loss of approximately 1330 jobs (1550 for two nuclear units down to 220 for the coal-fired plant), with a commensurate reduction in demand on socioeconomic resources and contribution to the regional economy. BGE would expect that the area's rapid population growth would prevent any destabilization of socioeconomic resources. For these reasons, the appropriate characterization of coal-fired generation socioeconomic impacts would be MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

Construction at another site would relocate some socioeconomic impacts, but would not eliminate them. The community around CCNPP would still experience the impact of CCNPP operational job loss, and the communities around the new site would have to absorb the impacts of a large, temporary workforce and a moderate, permanent workforce. Therefore, the impacts are MODERATE.

- **Aesthetics:** The three power plant units, which could be as much as 60-m (200-feet) tall, would be visible over intervening trees for miles around, particularly in both directions along the reach of the Chesapeake Bay. The three 180-m (600-foot) tall stacks could be visible as far away as Annapolis, a distance of 64 km (40 miles). This view would contrast strongly with what is otherwise a natural-appearing rural area, with woods and farming areas. Coal-fired generation would also introduce additional mechanical sources of noise (e.g., induced-draft fans and coal handling equipment) that may be audible offsite due to their proximity to the Bay.

The GEIS noted that aesthetic impacts from such a large construction effort in a rural area could be substantial. Industrial structures that would be located atop the 30-m (100-foot) cliffs at the CCNPP site would tower above area vegetation and create a noticeable visual impact for a large area. Aesthetics is a significant attribute of the Bay's western shore in the CCNPP site area, given the predominantly natural-appearing rural viewscape from the Chesapeake Bay. A coal-fired generating station would contrast strongly with the existing resource. The aesthetics impacts would be MODERATE to LARGE.

Alternative locations could reduce the aesthetic impact of coal-fired generation if siting was in an area that was already industrialized. In such a case, however, the introduction of such tall stacks and cooling towers would probably still have a MODERATE incremental impact. Other sites could show a LARGE impact.

- **Archaeological and Historic Resources:** The GEIS analysis noted that impacts to cultural resources would be relatively SMALL unless important site-specific resources were affected. Under this alternative, cultural resources inventories would be required for any lands that have not been previously disturbed to the extent that no archaeological or historic resources might remain. Other land, including areas where minimal disturbance of the surface, such as farming, has occurred, would require field cultural resources inventory, identification and recording of extant archaeological and historic resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site. Therefore, the impacts would be SMALL.

Construction at another site would necessitate studies to identify, evaluate, and mitigate potential impacts of new plant construction on cultural resources. This would be required 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, or other rights of way). Impacts can generally be managed and maintained as SMALL.

- **Environmental Justice:** No environmental pathways 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 CCNPP site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority or low-income populations. Impacts at other sites would depend upon the site chosen. These impacts would be MODERATE. If the replacement plant were built in Calvert County, the County's tax base would be largely maintained, and some potential negative socioeconomic impacts on the low-income or minority populations would be avoided. If the plant were built elsewhere, environmental justice impacts would be SMALL to LARGE, depending on the population distribution and make-up.

8.2.1.2 Closed-Cycle Cooling System

BGE has also evaluated a cooling-tower-based, closed-cycle cooling system that would use the existing intake and discharge structures (Gilbert/Commonwealth 1996). Flow requirements would be less (80 percent reduction) than the once-through cooling system. This alternative would add an approximately 160-m (520-foot) high natural draft cooling tower for each unit, which would occupy a total of 10 ha (25 acres). Cooling water consumption, due to evaporation, would be approximately 1.5 m³/s (35 million gpd). Total water flow, including tempering water and tower makeup water, would be 23 m³/s (520 million gpd). The closed-cycle cooling system would introduce cooling tower blowdown that would be at least two-and-one-half times as saline as the Chesapeake Bay. Cooling tower operation would require more electrical power than the once-through cooling system due to the modified pumping systems. The towers would discharge a plume of water vapor and a measurable amount of saltwater drift.

Mechanical draft cooling towers are an alternative to natural draft cooling towers. Mechanical draft cooling towers are 15- to 30-m (50- to 100-ft) tall, but would demonstrate operational impacts similar to the natural draft towers noted above.

The change in environmental impacts from redesigning the site for cooling towers are listed in Table 8-3. The overall impacts are also discussed below.

- **Land Use:** A closed-cycle cooling system alternative would impact an additional 10 ha (25 acres) for cooling tower construction at either the greenfield site or the CCNPP site. These alternatives would result in a minor to moderate change above those already considered for the once-through cooling alternative. The overall impact would be SMALL to MODERATE at CCNPP, MODERATE to LARGE elsewhere.

**Table 8-3. Summary of Environmental Impacts from Alternate Cooling System
(Cooling Towers with Closed-Cycle Cooling)**

Impact Category	Change in Impact from Calvert Cliffs Once-Through Cooling	Comments
Land Use	Minor to moderate change	10 additional ha (25 acres) required
Ecology	Minor change	<ul style="list-style-type: none"> • Additional impact to terrestrial ecology from salt drift • Reduced impact to aquatic ecology
Water Use and Quality		
Surface Water	Minor change	<ul style="list-style-type: none"> • Blowdown is 2-1/2 times as saline as Chesapeake Bay • Reduced flow
Groundwater	No change	None
Air Quality	No change	None
Waste	No change	None
Human Health	No change	None
Socioeconomics	No change	None
Aesthetics	Small change	<ul style="list-style-type: none"> • Addition of three 160-m (520-ft) cooling towers <u>OR</u> • Noise from mechanical draft towers
Archaeology and Historic Resources	Minor change	Minimal cultural studies possibly required
Environmental Justice	No change	None

- **Ecology:** The closed-cycle cooling system alternative would further reduce operational aquatic ecology impacts, but would introduce risk to vegetation, particularly tobacco crops, from salt drift. However, these ecological impacts result in minor changes above those for the once-through cooling alternative, resulting in SMALL overall impacts at CCNPP and MODERATE to LARGE impacts elsewhere.
- **Surface Water Use and Quality:** Although surface water impacts are expected to remain small, the closed-cycle cooling system alternative would introduce cooling tower blowdown that would be at least two-and-one-half times as saline as the Chesapeake Bay, but, because of the reduced flow, surface water quality impact changes would be minor; overall impacts would be SMALL at CCNPP and SMALL to MODERATE elsewhere.
- **Groundwater Use and Quality:** The facility's use of groundwater would not be impacted as a result of the variation between once-through cooling system and a cooling-tower-based system. Overall impacts would be SMALL at CCNPP and SMALL to MODERATE elsewhere.

- **Air Quality:** The air quality would be the same whether a cooling-tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be MODERATE at all locations.
- **Waste:** The amount of waste and impacts resulting from waste disposal would be the same whether a cooling-tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be MODERATE at all locations.
- **Human Health:** Human health effects would be the same whether a cooling-tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be SMALL at all locations.
- **Socioeconomics:** Socioeconomic impacts would be the same whether a cooling-tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts would be MODERATE at all locations.
- **Aesthetics:** The closed-cycle cooling system alternative would increase aesthetic impacts by adding three 160-m (520-ft) cooling towers and associated plumes. Although the ER assumed use of natural draft towers as an alternative technology, mechanical draft towers are also available. Such devices, being only 15- to 30-m (50- to 100-ft) tall, would reduce the visual impact of natural draft towers. Mechanical draft towers, however, introduce another noise source. Small incremental change; MODERATE to LARGE overall impact.
- **Archaeological and Historic Resources:** Minimal amounts of additional cultural resource studies would be required before construction of cooling towers. If towers were constructed on land that had already had cultural resource studies, further studies would not be necessary. Minor incremental change; SMALL impacts at all locations.
- **Environmental Justice:** Environmental justice impacts would be the same whether a cooling-tower-based closed-cycle cooling system or a once-through cooling system was used. Overall impacts are MODERATE at CCNPP; SMALL to LARGE elsewhere.

8.2.2 Gas-Fired Generation

In the ER, BGE described a representative gas-fired plant that was based on documentation submitted to the Maryland Public Service Commission (PSC) for the Perryman Power Plant (BGE 1989), coupled with EPA documentation for the Polk Power Station (EPA 1994). BGE also used this information to scale the size of the plant (megawatts and land usage) described in the ER. The Perryman and Polk facilities are typical of gas-fired technology being constructed and operated today. In addition, information from the EPA and DOE's Energy Information Administration (EIA) technical publications on fuel specifications and best available emission control technology was used to specify fuel types and

emission control technology that would be used in the gas-fired alternative (DOE 1995; EPA 1993). In some cases, BGE was able to use referenced data directly; in other cases, BGE appropriately scaled data to fit the size of the plant needed for a CCNPP alternative energy source.

It was assumed that it would take 1760-MW gas-fired generation to replace the 1690-MW CCNPP. The increased size over current CCNPP capacity would be necessary to offset increased internal electrical usage for pollution control and pumping water for cooling, but would not be as great as for the coal-fired alternative due to reduced cooling water flow and pollution control needs.

It was assumed that a replacement natural gas-fired plant would use combined cycle technology. 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 steam generator to generate additional electricity. The size, type, and configuration of gas-fired generation units and plants currently operational in the United States vary and include simple-cycle combustion and combined-cycle units that range in size from 25 MW to 600 MW (EPA 1994). As with coal-fired technology, units may be configured and combined at a location to produce the desired amount of megawatts, and construction can be phased to meet electrical power needs.

8.2.2.1 Once-Through Cooling System

The gas-fired generation alternative consists of four 440-MW combined-cycle units each consisting of two 155-MW simple-cycle combustion turbines and a 130-MW heat recovery steam generator. On an average annual basis, these units would each generate up to 440 MW, providing the 1760 MW needed to replace CCNPP. Natural gas typically has an average heating value of 3.7×10^7 J/m³ (1,000 BTU per cubic foot) (DOE 1996; EPA 1993), and it would be the primary fuel; the gas-fired alternative plant would burn approximately 10^8 J/m³-s (10 million cubic feet per hour). Low-sulfur No. 2 fuel oil would be the backup fuel (BGE 1989).

Each unit would be less than 30 m (100 feet) high and would be designed with dry, low NO_x combustors, water injection, and selective catalytic reduction. Each unit would exhaust through a 70-m (230-foot) stack after passing through heat recovery steam generators. This stack height is consistent with EPA regulations (40 CFR 51.100), which address requirements for determining the stack height of new emission sources. Section 51.100 allows stack heights based on good engineering stack height (as defined) or modeling, but does not allow credit for offsite contaminant level reduction for taller stacks. The 70-m (230-foot) height is based on the regulation's good engineering practice formula using the tallest proposed onsite facility (i.e., the 28-m [92-foot] turbine building). While modeling would have to be used to justify stack height greater than 70-m (230 feet), the relatively flat terrain and low structures of the area indicate that modeling would not likely support a greater stack height.

Natural gas would be delivered via a newly constructed connection to the existing pipeline located parallel to Maryland Highway 2-4 near the CCNPP site, a distance of approximately 2.4 km (1.5 miles)

(US Geological Survey 1987). The proposed route would follow an existing Southern Maryland Electric Cooperative power line right-of-way onto the CCNPP site adjacent to the Lake Davies area. Approximately 4 ha (10 acres) would be disturbed during pipeline construction. The existing line currently has sufficient reserve capacity to supply the needs of the gas-fired alternative.

Environmental impacts of conversion to the gas-fired generation option at both CCNPP and a greenfield site are summarized in the following text and are listed in Table 8.4.

- **Land Use:** Gas-fired generation at the Calvert Cliffs site would require converting an additional 25 ha (60 acres) of the site to industrial use. This 25 ha (60 acres) would be used for the power block (BGE 1989). Currently, some of this land is farmed, and the rest is a revegetated dredged spoils disposal area. An additional 4 ha (10 acres) would be disturbed during pipeline construction. Some additional land would also be required for backup oil storage tanks. Gas-fired generation land-use impact at the existing CCNPP site is SMALL; the impact would not be detectable or would be so minor that it would neither destabilize nor noticeably alter any important attribute of the resource.

Construction at a greenfield site would impact approximately 4 ha (10 acres) for offices, roads, parking areas, and a switchyard. The power block would require 25 ha (60 acres). Some additional land would also be required for backup oil storage. In addition, it is assumed that another 170 ha (424 acres) would be necessary for transmission lines (assuming the plant is sited 10 miles from the nearest intertie connection), although this is uncertain and would depend on actual plant location. Including the land required for pipeline construction, a greenfield site would require approximately 200 ha (500 acres). Depending on the transmission line routing, the greenfield site alternative could result in SMALL to MODERATE land-use impacts.

The GEIS estimated that land-use requirements for a 1000-MW gas-fired plant at a greenfield site would be SMALL (approximately 45 ha [110 acres] for the plant site), and that colocating with a retired nuclear plant would reduce these impacts. The BGE land-use estimate is less than the NRC estimate and is roughly one-tenth of the BGE estimate for coal-fired generation. The land-use change should not noticeably alter the overall site natural land-use pattern. Therefore, the impacts would be SMALL to MODERATE.

- **Ecology:** Siting gas-fired generation at the existing CCNPP site would have little ecological impact because the facility would be constructed on previously disturbed areas. Additional acreage would include farmland and a dredged spoils disposal area. Ecological impacts would also be minimized by using the existing intake and discharge system. The impact to Chesapeake Bay ecology would be expected to remain unchanged because the operational monitoring of the effects of once-through cooling at CCNPP have not shown significant negative impacts. At the existing site, adding gas-fired generation would introduce construction impacts and new, albeit incremental, operational impacts.

**Table 8-4. Summary of Environmental Impacts from Gas-Fired Generation—
Once-Through Cooling Alternative**

Impact Category	Calvert Cliffs Site		Alternative "Greenfield" Site	
	Impact	Comments	Impact	Comments
Land Use	SMALL	<ul style="list-style-type: none"> • Additional 25 ha (60 acres) required for power block • Additional 4 ha (10 acres) disturbed for pipeline construction • Additional land for backup oil storage tanks 	SMALL to MODERATE	<ul style="list-style-type: none"> • 200 ha (500 acres) required for site, pipelines, and an estimated 10-mi transmission line connection • Additional land for backup oil storage tanks
Ecology	SMALL	Constructed on previously disturbed areas	SMALL to MODERATE	Impact depends on location and endangered and threatened species
Water Use and Quality:				
- Surface Water	SMALL	70 percent reduction in water flow	SMALL to MODERATE	Impact depends on volume and characteristics of receiving body of water
- Groundwater	SMALL	Reduced groundwater withdrawals due to reduced workforce	SMALL	Groundwater would be used for potable water only
Air Quality	SMALL to MODERATE	Primarily nitrogen oxides. Impacts could be noticeable, but not destabilizing	SMALL to MODERATE	Same impacts as for CCNPP
Waste	SMALL	Waste generation is minor	SMALL	Same impacts as for CCNPP
Human Health	SMALL	Impacts considered to be minor	SMALL	Same impacts as for CCNPP
Socioeconomics	SMALL	500 to 750 additional workers during 3-year construction period; followed by reduction from 1550 persons to 125 persons	SMALL	Construction impacts would be relocated. Community near CCNPP would still experience reduction from 1550 persons to 125 persons.
Aesthetics	SMALL to MODERATE	Visual impact of stacks and equipment would be noticeable, but not as significant as coal option	SMALL to MODERATE	Alternate locations could reduce the aesthetic impact if siting is in an industrial area.
Archaeological and Historic Resources	SMALL	Only previously disturbed areas would likely be affected	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income communities should be similar to those experienced by the population as a whole. Impacts on housing are possible.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup

The GEIS noted that land-dependent ecological impacts from construction would be SMALL unless site-specific factors should indicate a particular sensitivity, and that operational impacts would be smaller than for other fossil fuel technologies of equal capacity. The staff has identified no site-specific factors that would make gas-fired alternative ecological impacts larger than for the coal-fired alternative or license renewal. The appropriate characterization of gas-fired generation ecological impacts would be SMALL.

Construction at a greenfield site would certainly alter the ecology of the site and could impact threatened and endangered species. These ecological impacts could be SMALL to MODERATE.

- **Water Use and Quality:** The plant would use the existing CCNPP intake and discharge structures as part of a once-through cooling system; however, since cooling requirements would be less (70 percent reduction), flows would average approximately 2.3 m³/s (1000 million gpd) (EPA 1994). Water quality impacts would continue to be SMALL. The reduced workforce size (1550 to 125) would reduce groundwater withdrawals for potable water use; however, the existing groundwater impact is already small (Section 4.5.1).

Water quality impacts from sedimentation during construction was another land-related impact that the GEIS categorized as SMALL. The GEIS also noted that operational water quality impacts would be similar to, or less than, those from other centralized generating technologies. The staff has concluded that water quality impacts from coal-fired generation would be SMALL, and gas-fired alternative water usage would be less than that for coal-fired generation. Surface water impacts would remain SMALL; the impacts would not be detectable or be so minor that they would not noticeably alter any important attribute of the resource.

For alternative greenfield sites, the impact on surface water would depend on the volume and other characteristics of the receiving body of water. The impacts would be SMALL or MODERATE. The impact on the groundwater would remain SMALL, since the groundwater would just be used for potable water, and the number of employees would be similar at either site.

- **Air Quality:** Natural gas is a relatively clean-burning fuel, but, due to the site's location within the Northeast Ozone Transport Region and the Washington, D.C. nonattainment area for ozone, air quality impacts of gas-fired generation would be of concern. NO_x emissions from the gas-fired alternative would be 350 MT (386 tons) per year (assuming a 60 percent thermal efficiency and 0.004 kg [0.0088 pounds] NO_x per 10⁹ J [10⁶ BTU]). As discussed in Section 8.2.1 for coal-fired generation, regulations implementing Section 407 of the CAA might result in BGE having to further reduce NO_x by shutting down other sources or by backfitting to reduce NO_x formation (e.g., installing over-fired air, low NO_x burners, flue gas recirculation, and selective non-catalytic and catalytic reduction systems). Because of required offsets, a new combustion source could not add emissions on a regional basis, but it could locally.

The GEIS noted that gas-fired air quality impacts are less than other fossil technologies because fewer pollutants are emitted, and SO₂ is not emitted at all. Emissions from the gas-fired alternative would be less than emissions from the coal-fired alternative. However, the gas-fired alternative would contribute NO_x emissions to an area that is classified as a serious nonattainment area for ozone. Because NO_x contribute to ozone formation, the reduced NO_x emissions are still of concern, and low NO_x combustors, water injection, and selective catalytic reduction are regulatory-imposed mitigation measures. For these reasons, the appropriate characterization of gas-fired generation air impacts would be SMALL to MODERATE; the impacts, primarily NO_x, would be clearly noticeable, but would not be sufficient to destabilize air resources as a whole. Siting the gas-fired plant elsewhere would not significantly change air quality impacts, although the site could be located in an area that was not a serious nonattainment area for ozone. In addition, the location could result in installing more or less stringent pollution control equipment to meet the regulations. Therefore, the impacts would be MODERATE.

- Waste: There should be no solid waste products (i.e., ash) from natural gas fuel-burning. The GEIS concluded that waste generation from gas-fired technology would be minimal. Gas-firing results in very little combustion byproduct because of the clean nature of the fuel. Waste generation would be limited to typical office wastes. This impact would be SMALL; waste generation impacts would be so minor that they would not noticeably alter any important resource attribute. Siting the facility at an alternate greenfield site would not alter the waste generation; therefore, the impacts would continue to be SMALL.
- Human Health: The GEIS analysis mentions potential gas-fired alternative health risks (cancer and emphysema). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contributes to health risks. As discussed in Section 8.2.1 for the coal-fired alternative, legislative and regulatory control of the nation's emissions and air quality are protective of human health, and the appropriate characterization of gas-fired generation human health impacts would be SMALL; that is, human health effects would not be detectable or would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Siting of the facility at an alternate greenfield site would not alter the human health effects that would be expected. Therefore, the impacts would be SMALL.
- Socioeconomics: It is assumed that gas-fired construction would take place while CCNPP continues operation, with completion at the time that the nuclear plant would halt operations. Construction of the gas-fired alternative would take approximately 3 years, and the work force during the construction period would average 500, with a peak of 750. Therefore, for the 3-year construction period, the site would have between 500 and 750 additional workers. During this time, the surrounding communities would experience demands on housing and public services that could have large impacts. After construction, the communities would be impacted by the loss of jobs; construction workers would leave, the nuclear plant workforce (1550) would decline through a

decommissioning period to a minimal maintenance size, and the gas-fired plant would introduce about 125 new jobs.

The GEIS noted that gas-fired construction socioeconomic impacts would not be very noticeable and that the small operational workforce would have the lowest socioeconomic impacts (local purchases and taxes) of any nonrenewable technology. BGE estimates that, compared to the coal-fired alternative, the smaller size of the construction workforce, the shorter construction timeframe, and smaller size of the operations workforce all would reduce socioeconomic impacts. For these reasons, gas-fired generation socioeconomic impacts would be **SMALL**; that is, socioeconomic effects would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.

Construction at another site would relocate some socioeconomic impacts, but would not eliminate them. The community around the CCNPP site would still experience the impact of CCNPP operational job loss, and the communities around the new site would have to absorb the impacts of a large, temporary workforce and a moderate, permanent workforce. Therefore, the impacts would be **SMALL**.

- **Aesthetics:** The combustion turbines and heat recovery boilers would be relatively low structures and would be screened from most offsite vantage points by intervening woodlands. The steam turbine building would be taller, approximately 30 m (100 feet) in height, and together with 70-m (230-ft) exhaust stacks, would be visible offsite.

The GEIS analysis noted that land-related impacts, such as aesthetic impacts, would be small unless site-specific factors indicate a particular sensitivity. As in the case of the coal-fired alternative, aesthetic impacts from the gas-fired alternative would be noticeable. However, because the gas-fired structures are shorter than the coal-fired structures and more amenable to screening by vegetation, the staff determined that the aesthetic resources would not be destabilized by the gas-fired alternative. For these reasons, the appropriate characterization of gas-fired generation aesthetic impacts would be **SMALL to MODERATE**; the impacts would be clearly noticeable, but would not destabilize this important resource.

Alternative locations could reduce the aesthetic impact of gas-fired generation if siting was in an area that was already industrialized. In such a case, however, the introduction of the steam generator building, stacks, and cooling tower plumes would probably still have a **SMALL to MODERATE** impact.

- **Archaeological and Historic:** The GEIS analysis noted, as for the coal-fired alternative, that gas-fired alternative cultural resource impacts would be small unless important site-specific resources were affected. Gas-fired alternative construction at the CCNPP site would affect a smaller area within the footprint of the coal-fired alternative. As discussed in 8.2.1, site knowledge

minimizes the possibility of cultural resource impacts. Cultural resource impacts would be **SMALL**; that is, cultural resource effects would not be detectable or would be so minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Therefore, the impact is **SMALL**.

Construction at another site could necessitate instituting cultural resource preservation measures, but impacts can generally be managed and maintained as **SMALL**. Cultural resources studies would be required for the pipeline construction and any other areas of ground disturbance associated with this alternative.

- **Environmental Justice:** No environmental pathways have been identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement gas-fired plant were built at the CCNPP site. Some impacts on housing availability and prices during construction might occur, and this could disproportionately affect the minority or low-income populations. The impacts would be **SMALL to MODERATE**. Impacts at other sites would depend upon the site chosen. If the replacement plant were built in Calvert County, the County's tax base would be largely maintained and some potential negative socioeconomic impacts on the minority or low-income populations would be avoided. If the plant were built elsewhere, Environmental Justice impacts would be **SMALL to MODERATE**, depending on the population density and make-up.

8.2.2.2 Closed-Cycle Cooling System

BGE assumes that cooling for the gas-fired facility could also be accomplished by a closed-cycle system, which would also use the existing intake and discharge structures, but flow requirements would be 90 percent less than the once-through cooling system (Gilbert/Commonwealth 1996). This alternative would use an approximately 160-m (520-ft) high natural draft cooling tower for each unit. Cooling water consumption, due to evaporation, would be approximately 0.44 m³/s (10 million gpd). Total water flow, including tempering water and tower makeup water, would be 6.7 m³/s (152 million gpd). The closed-cycle cooling system alternative would introduce cooling tower blowdown that would be at least two-and-one-half times as saline as the Chesapeake Bay. Cooling tower operation would require more electrical power than the once-through alternative due to the modified pumping systems. Cooling towers would discharge a plume of water vapor and a small amount of saltwater drift.

Mechanical draft cooling towers are an alternative to natural draft cooling towers. Mechanical draft cooling towers are 15- to 30-m (50- to 100-ft) tall, but would demonstrate operational impacts similar to the natural draft towers noted above.

The environmental impacts of converting to a closed-cycle cooling system are essentially the same impacts as for the closed-cycle cooling system at a coal-fired plant. The impacts are discussed in Section 8.2.1.1 and are listed in Table 8-5.

Table 8-5. Summary of Environmental Impacts of Gas-Fired Generation with Alternate Cooling System (Cooling Towers with Closed-Cycle Cooling)

Impact Category	Change in Impact from Calvert Cliffs Once-Through Cooling	Comments
Land Use	Minor to moderate change	Uses an additional 10 ha (25 acres) for cooling tower construction
Ecology	Minor change	<ul style="list-style-type: none"> • Additional impact to terrestrial ecology from salt drift • Reduced impact to aquatic ecology
Water Use and Quality:		
- Surface Water	Minor change	<ul style="list-style-type: none"> • Blowdown is 2-1/2 times as saline as Chesapeake Bay • Reduced flow
- Groundwater	No change	None
Air Quality	No change	None
Waste	No change	None
Human Health	Small	Impacts considered minor
Socioeconomics	No change	None
Aesthetics	Minor change	Addition of four 160-m (520-ft) high natural draft cooling towers or noise from mechanical draft towers
Archaeology and Historical Resources	Minor change	Minimal studies (if necessary) prior to construction of cooling towers
Environmental Justice	No change	None

8.2.3 Imported Electrical Power

"Imported power" means power purchased and transmitted from electric generation plants that the applicant does not own and that are located elsewhere within the region, nation, or Canada. The applicant imports substantial amounts of power from Ohio and Pennsylvania, especially from the Conemaugh and Keystone plants in western Pennsylvania. In 1996, Maryland was a substantial net importer of electricity; imports represented approximately 28 percent of electrical sales within the State. The applicant imported approximately 10,500 gigawatt-hours in 1996, approximately 28 percent of total sales (MDNR 1999a). In theory, importing (purchasing) additional power is a feasible alternative to CCNPP license renewal. However, regardless of the technology used to generate imported power, the generating technology would be one of those described in this SEIS and in the GEIS (probably coal, natural gas, nuclear, or Canadian hydroelectric). The GEIS, Chapter 8, description of the

environmental impacts of other technologies is representative of the imported electrical power alternative to CCNPP license renewal.

BGE stated that bulk sales and purchased power will continue to expand:

Recent generating additions in the competitive electric market have been primarily either simple cycle combustion turbines or combined cycle facilities with a lesser amount of coal-fired plants. BGE has stated and still believes that future generation additions will be predominantly satisfied by those technologies. With the evolution of regional and national bulk power markets, the movement of electric energy between regions is expected to grow. There is a high probability that the importation of energy from Canada will continue. From a historical perspective, it has been BGE's experience that replacement energy for CCNPP is predominantly provided by interchange purchases from the Pennsylvania-New Jersey-Maryland (PJM) Interconnection, unless a specific bilateral contract has been effected (BGE 1998a). Since April 1998, the PJM power pool has operated with an independent system operator and Pool Spot Energy Market (PX) that uses cost-based bids from generators on a day-ahead basis. Membership in the PJM is open to different segments of the industry.

According to the EIA's International Energy Outlook 1998 (EIA 1997):

Hydro Quebec has targeted the U.S. market for future sales growth. Hydro Quebec currently owns Vermont Gas and has signed a deal with Enron to market electricity in the Northeast while selling Enron's gas in Quebec. In April 1997, Hydro Quebec petitioned the Federal Energy Regulatory Commission (FERC) to sell electricity in the United States. In return, it would allow U.S. competitors to wheel electricity into Quebec. In November 1997, Hydro Quebec received FERC approval to sell power in the United States at market-based rates.

Depending on transmission availability, relative power costs, whether Canadian environmental and aboriginal rights controversies over the hydroelectric James Bay Project in Northern Quebec could be solved, and appropriate transmission agreements and facilities could be put in place, Hydro Quebec could be a future source of imported power. However, there would be significant environmental impacts in Northern Quebec.

8.2.4 Other Alternatives

This section identifies alternatives to CCNPP license renewal that are not feasible as direct replacements for CCNPP and describes why the alternatives are not considered feasible.

8.2.4.1 Wind

Wind speeds in most areas of Maryland average 13 to 16 km (8 to 10 mi) per hour. The GEIS stated average wind speeds of more than 21 km (13 mi) per hour are normally required for wind turbines to operate efficiently. Some areas of western Maryland may have potential for use of wind energy, but these locations, found at the highest levels of sharp ridge lines, would incur high costs for land acquisition and power line construction (MDNR 1986). Based on the GEIS land use estimate for wind power (the GEIS, Section 8.3.1, estimates 60,750 ha [150,000 acres] per 1000 MW-electric for wind power), replacement of CCNPP generating capacity, even assuming ideal wind conditions, would require dedication of almost 13,000 km² (400 mi²), an area about twice the size of the county (Calvert County is approximately 5250 km² [220 mi²]) in which CCNPP is located. Based on the lack of sufficient wind speeds and the amount of land needed to replace CCNPP, the wind alternative would require a large greenfield site, which would result in a LARGE environmental impact.

8.2.4.2 Solar

Solar power technologies, photovoltaic and thermal, cannot currently compete with conventional fossil-fueled technologies in grid-connected applications due to high costs per kilowatt of capacity (DOE 1995). Maryland receives slightly more than 3.3 kilowatt-hours of solar radiation per square meter (kWh/m²) per day, compared to 5 to 7.2 kWh/m² per day in areas of the West, such as California, which are most promising for solar technologies (GEIS, Section 8.3.3). Because of the area's low rate of solar radiation and high technology costs, the role of solar power in Maryland is limited to niche applications and is not a feasible baseload alternative to CCNPP license renewal.

8.2.4.3 Hydropower

Approximately 4 percent, or 535 MW, of Maryland generating capacity is hydroelectric (MDNR 1996). As GEIS, Section 8.3.4 points out, 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 destruction of natural river courses. GEIS, Section 8.3.4, estimates land use of 400,000 ha (1 million acres) per 1000 MW-electric for hydroelectric power. Based on this estimate, replacement of CCNPP generating capacity would require flooding more than 6700 km² (2600 mi²), a LARGE impact on land use. Due to the lack of locations for siting a hydroelectric facility large enough to replace CCNPP, local hydropower is not a feasible alternative to CCNPP license renewal on its own. See Section 8.2.3 for a discussion of Canadian hydropower.

8.2.4.4 Geothermal

As illustrated by GEIS, Figure 8.4, geothermal plants might be located in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent, but would not be a feasible alternative to CCNPP license renewal in Maryland.

8.2.4.5 Wood Energy

A significant barrier to the use of wood waste to generate electricity is the high delivered fuel cost. States with significant wood resources, such as California, Maine, Georgia, Minnesota, Oregon, Washington, and Michigan benefit from using local resources. The pulp, paper, and paperboard industries, which consume large quantities of electricity, are the largest consumer of wood and wood waste for energy, benefitting from the use of waste materials that could otherwise represent a disposal problem. However, the larger wood waste power plants are only 40 to 50 MW in size. The 10^{15} J (11.5 trillion BTU) of energy estimated to be available annually from Maryland forests (MDNR 1986) would only produce the amount of electricity that CCNPP produces in one month. Due to the lack of sufficient resource base in the Maryland area, wood waste is not a feasible alternative to renewing the CCNPP licenses.

8.2.4.6 Municipal Solid Waste

The decision to burn municipal waste to generate energy is usually driven by the need for an alternative to landfills rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; however, it is unlikely that many landfills will begin converting waste to energy because of unfavorable economics, particularly with electricity prices declining (DOE 1995). Therefore, municipal solid waste would not be a feasible alternative to CCNPP license renewal, particularly at the scale required.

8.2.4.7 Other Biomass-Derived Fuels

In addition to wood and municipal solid waste fuels, there are several other concepts for fueling electric generators, including burning energy crops, converting crops to a liquid fuel such as ethanol (ethanol is primarily used as a gasoline additive for automotive fuel), and gasifying energy crops (including wood waste). None of these technologies have progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as CCNPP. For these reasons, such fuels do not offer a feasible alternative to CCNPP license renewal. In addition, these systems have LARGE impacts on land use.

8.2.4.8 Oil

BGE has several oil-fired units. However, the cost of oil-fired operation is about eight times as expensive as nuclear and coal-fired operation. In addition, future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation (DOE 1996). For these reasons, oil-fired generation is not a feasible alternative to CCNPP license renewal nor is it likely to be included in a mix with other resources, except as a back-up fuel.

8.2.4.9 Advanced Nuclear Power

Work on advanced reactor designs has continued, and nuclear plant construction continues overseas. However, the cost of building a new nuclear plant and the political uncertainties that have historically surrounded many nuclear plant construction projects are among the factors that have led energy forecasters such as the EIA to predict no new domestic orders for the duration of current forecasts—through the year 2010 (DOE 1996). For these reasons, new nuclear plant construction is not considered a feasible alternative to CCNPP license renewal.

8.2.4.10 Delayed Retirement

CCNPP provides about 27 percent of BGE's generating capacity and approximately 40 percent of its energy requirements. Even without retiring any generating units, BGE expects to require additional capacity in 2000 or 2001. Thus, even if substantial capacity were scheduled for retirement and could be delayed, some of the delayed retirement would be needed just to meet load growth.

In the current Stranded Cost Filing with the Maryland Public Service Commission, BGE used the 1992 Technical Update of Depreciation Rates for BGE for the purpose of modeling power plant retirement. This retirement schedule is presented in Table 8-6.

Using a reserve obligation of 15 percent and based on information from the 1998 BGE Integrated Resource Plan, BGE will have a PJM reserve obligation of 6759 MW (5877×1.15) in the year 2000. With a current supply portfolio projected to be 6562 MW, BGE is expecting to be deficient by nearly 200 MW in the year 2000, even with CCNPP available. During the assessment of capacity requirements for the ER, BGE did not incorporate any retirement plans (BGE 1998b) (i.e., the plants in Table 8-6 were assumed to be available). Therefore, CCNPP would be required in part to offset any actual retirements that occur, so that delayed retirement of other BGE generating units could not provide a replacement of the 1690 MW supplied by CCNPP and could not be a feasible alternative to CCNPP license renewal.

8.2.4.11 Utility-Sponsored Conservation

The Maryland PSC requires Maryland electric utilities to implement demand-side management^(a) as a means to conserve energy and to take demand-side management energy savings into account in long-range planning. The applicant has an extensive program of residential, commercial, and industrial

(a) The GEIS, Section 8.3.14, discusses conservation technologies to conserve energy consumption. These measures generally come under the heading of "demand-side management," which is a collection of diverse measures to reduce customers' electricity consumption without adversely affecting service.

Table 8-6. Retirement Schedule of BGE Power Plants

BGE RETIREMENT SCHEDULE FOR STRANDED COST FILING		
Unit Name	Summer Capacity (MW)	Retirement Year
Gould Street 3	104	2010
Riverside 4	78	2010
C.P. Crane CT	14	2010
H.A. Wagner CT 1	14	2010
Notch Cliff 1-8	128	2010
Philadelphia Road 1-4	64	2010
Perryman 1-4	208	2010
Riverside 6-8	173	2010
Westport 5	121	2010
Total	904	
C.P. Crane 1	190	2015
C.P. Crane 2	195	2015
H.A. Wagner 1	137	2015
H.A. Wagner 2	135	2015
H.A. Wagner 3	324	2015
H.A. Wagner 4	410	2015
Total	1391	

programs designed to reduce both peak demands and daily energy consumption (demand-side management). Program components include the following:

- **Peak clipping programs:** Include energy saver switches for air conditioners, heat pumps, and water heaters, allowing the applicant to interrupt electrical service to reduce load during periods of peak demand; dispersed generation, giving the applicant dispatch control over customer backup generation resources; and curtailable service, allowing the applicant to reduce customers' load during periods of peak demand.
- **Load shifting programs:** Use time-of-use rates and cool storage rebate programs to encourage shifting loads from on-peak to off-peak periods.

- **Conservation programs:** Promoting use of high-efficiency heating, ventilating, and air conditioning; encouraging construction of energy-efficient homes and commercial buildings; improving energy efficiency in existing homes; providing incentives for use of energy-efficient lighting, motors, and compressors.

The applicant originally estimated that its demand-side management program would produce an annual peak demand generation reduction of about 700 MW, and BGE believed that it could continue to increase generation savings from demand-side management. The applicant's load growth projection anticipated a demand-side management savings of about 1000 MW in 2016. Because these savings are part of the long-range plan for meeting projected demand, however, it is not available as an "offset" for CCNPP, and the applicant did not foresee availability of another 1690 MW (CCNPP capacity). For these reasons, the demand-side management is not a feasible alternative to renewing the CCNPP license.

Each of the conservation program components identified by the applicant still exist in their load management programs. However, the emerging competitive electricity market along with pending retail choice for customers has significantly reduced the long-term growth expectations for most programs (MDNR 1999). BGE's 1998 integrated resource plan (IRP) response to the Maryland PSC indicated an existing total of about 730 MW in 1997, whereas the existing value for 1996 reported in the ER was "about 700 MW." BGE's expectation for the future indicates a value of approximately 750 MW in 2012, whereas the ER reported a value of "about 1000 MW in 2016" (BGE 1998a).

BGE states that their conclusion remains unchanged in view of the update to their IRP and is further reinforced by diminishing long-term expectations for load management. The staff has reviewed the available information and concurs in this finding.

BGE (with the concurrence of the Maryland PSC) recently has eliminated nearly all of its ongoing conservation programs. Maryland's restructuring legislation requires that the PSC review the need for conservation programs according to certain criteria. The review will take place in consultation with the Maryland Energy Administration (MEA). The outcome of such a PSC review cannot be predicted at this time. The present outlook is that utility-sponsored conservation programs in the future will likely be smaller in scope than in the past.

With reduced utility efforts and investment in conservation programs, it is unclear whether market forces under a restructured environment will enhance or retard customer conservation efforts. However, to the extent restructuring leads to lower retail rates, this will encourage greater demand for electricity (price elasticity effects), thereby undermining or offsetting the possibility that conservation programs could substitute for or replace CCNPP (MDNR 1999b).

8.2.4.12 Fuel Cells

Phosphoric Acid Fuel Cells are the most mature fuel cell technology, but they are only in the initial stages of commercialization. Two hundred turn-key plants have been installed in the United States, Europe and Japan. Recent estimates suggest that a company would have to produce about 100 MW of fuel cell stacks annually to achieve a price of \$1000 to \$1500 per kilowatt (DOE 1999). However, the current production capacity of all fuel cell manufacturers only totals about 60 MW per year. Therefore, the staff considers fuel cells not to be a feasible alternative to license renewal at this time.

8.2.4.13 Combination of Alternatives

Even though individual alternatives to CCNPP might not be sufficient on their own to replace CCNPP due to the small size of the resource (hydro) or lack of cost-effective opportunities (e.g., for conservation), it is conceivable that a mix of alternatives might be cost-effective. For example, if some additional cost-effective conservation opportunities could be found and combined with a smaller imported power or natural gas-fired alternative, it might be possible to reduce some of the key environmental impacts of alternatives. However, it is unlikely that the environmental impact of such a hypothetical mix could be reduced below SMALL (see Table 8-7). The impacts of renewing the CCNPP licenses are SMALL on all dimensions.

8.3 References

40 CFR 50.9, "National primary and secondary ambient air quality standard for nitrogen dioxide."

40 CFR 50.10, "National 8-hour primary and secondary ambient air quality standards for ozone."

40 CFR 51.100, "Definitions."

Baltimore Gas and Electric Company (BGE). 1989. *Perryman Power Plant Certification of Public Convenience and Necessity, Environmental Review Document, Volume 2*. Baltimore, Maryland.

Baltimore Gas and Electric (BGE). 1998a. *Calvert Cliffs Nuclear Power Plant Units 1 and 2 License Renewal Application, Volume 3*. Lusby, Maryland.

Baltimore Gas and Electric (BGE). 1998b. Letter from Mr. C.H. Cruse (BGE) to NRC Document Control Desk, "Response to Request for Additional Information for the Review of the Calvert Cliffs Nuclear Power Plant Unit Nos. 1 & 2, Environmental Report Associated with License Renewal, and Errata (TAC Nos. MA1524 and MA1525)," November 20, 1998, Lusby, Maryland.

Baltimore Gas and Electric (BGE). 1995. *Integrated Resource Plan*. Lusby, Maryland.

Table 8-7. Summary of Environmental Impacts of 500 MW(e) Demand-Side Measures, Plus 1200 MW(e) Gas-Fired Generation (Once-Through Cooling)

Impact Category	Calvert Cliffs Site		Alternative "Greenfield" Site	
	Impact	Comments	Impact	Comments
Land Use	SMALL	<ul style="list-style-type: none"> • Additional 18 ha (45 acres) required for power block • Additional 4 ha (10 acres) disturbed for pipeline construction • Additional land for backup oil storage 	SMALL to MODERATE	<ul style="list-style-type: none"> • 200 ha (500 acres) required for site plus transmission line, backup fuel tanks, pipeline
Ecology	SMALL	Constructed on previously disturbed land	SMALL to MODERATE	Impact depends on location and threatened and endangered species
Water Use and Quality:				
- Surface Water	SMALL	>70 percent reduction in water flow	SMALL to MODERATE	Impact depends on receiving body of water
- Groundwater	SMALL	Reduced groundwater withdrawals due to reduced workforce	SMALL to MODERATE	Groundwater would be used for potable water only
Air Quality	SMALL to MODERATE	Primarily nitrogen oxides	SMALL to MODERATE	Same impacts as for CCNPP site
Waste	SMALL	Minor waste generation with gas (oil not evaluated)	SMALL	Same impacts as for CCNPP site
Human Health	SMALL	Impacts considered to be minor (see discussion of gas-fired alternative)	SMALL	Same impacts as for CCNPP site
Socioeconomics	SMALL	250 to 400 additional workers during a 2- to 3-year construction period; followed by a reduction in employment from 1550 persons at CCNPP to 125 persons	SMALL to MODERATE	Construction impacts would be relocated. Community near CCNPP would still experience reduction from 1700 workers to 0. Other community gains 125 workers.
Aesthetics	SMALL to MODERATE	Visual impact of stacks would be noticeable, but less so than for the gas-fired alternative	SMALL to MODERATE	Alternate locations could reduce aesthetic impact if siting is in an industrial area.
Archaeological and Historic Resources	SMALL	Only previously disturbed and adjacent areas would likely be affected	SMALL	Alternate location would necessitate cultural resource studies
Environmental Justice	SMALL to MODERATE	Impacts on minority and low-income should be similar to those experienced by the population as a whole. Greater loss of revenues by county, less construction impact.	SMALL to MODERATE	Impacts vary depending on population distribution and makeup

Alternatives to License Renewal

- | Clean Air Act (CAA), as amended, 42 USC, 7401 et seq.
- Delmarva Power and Light Company. 1992. *Final Site Selection Study; 600 MW Coal-Fired Power Plant*.
- Energy Information Administration (EIA). 1997. *Annual Energy Outlook 1998*, Table A2. DOE/EIA-0383(98), Washington, D.C.
- Gilbert/Commonwealth, Inc. 1996. *Update to Calvert Cliffs Nuclear Power Plant Units 1 & 2 Cooling Tower System Study*.
- | Maryland Department of the Environment (MDE). 1994. *State Discharge Permit Number 92-DP-0187; Calvert Cliffs Nuclear Power Plant*.
- Maryland Department of Natural Resources (MDNR). 1986. *Power Plant Cumulative Environmental Impact Report for Maryland*, PPER-CEIR-5. Maryland Power Plant Siting Program, Annapolis, Maryland.
- Maryland Department of Natural Resources (MDNR). 1996. *Maryland Power Plants and the Environment: A Review of the Impacts of Power Plant and Transmission Lines on Maryland's Natural Resources, Supporting Materials*, PPRP-CEIR-9/2. Maryland Power Plant Research Program, Annapolis, Maryland.
- | Maryland Department of Natural Resources (MDNR). 1999a. *Maryland Power Plants and the Environment: A review of the impacts of power plants and transmission lines on Maryland's natural resources*, PPRP-CEIR-10. Maryland Power Plant Research Program, Annapolis, Maryland.
- | Maryland Department of Natural Resources (MDNR). 1999b. Letter from Richard I. McLean, Manager, Nuclear Programs to Chief, Rules Review and Directives Branch, Division of Administrative Services, Nuclear Regulatory Commission, May 19, 1999.
- | South Carolina Electric and Gas Company. 1991. *Environmental Assessment for Cope Power Plant*.
- U.S. Department of Energy (DOE). 1995. *Electric Power Annual*. Energy Information Administration, Washington, D.C.
- U.S. Department of Energy (DOE). 1996. *Annual Energy Outlook; 1996 with Projections to 2015*, DOE/EIA-0383(96). Energy Information Administration, Washington, D.C.

U.S. Department of Energy (DOE). 1999. *Advanced Fuel Cell Systems - A Revolutionary Power Technology*, Fossil Energy-Fuel Cell Power Systems Overview.
(http://www.fe.doe.gov/coal_power/fc_sum.html) (accessed August 4, 1999).

U.S. Environmental Protection Agency (EPA). 1993. *Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources*, EPA, AP-42. Washington, D.C.

U.S. Environmental Protection Agency (EPA). 1994. *Final Environmental Impact Statement, Volume I: Tampa Electric Company - Polk Power Station*, EPA 904/9-94-002. Washington, D.C.

U.S. Geological Survey (USGS). 1987. *Cove Point, Maryland, Scale 1:24000* (7.5-minute map).

U.S. Nuclear Regulatory Commission (NRC). 1988. *Final Generic Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586. Washington, D.C.

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

9.0 Summary and Conclusions

By letter dated April 8, 1998, BGE submitted an application to the NRC to renew the CCNPP operating licenses for Units 1 and 2 for an additional 20-year period (BGE 1998). If the operating licenses are renewed, continued operation of the plant will be at the discretion of BGE, State, and, where authorized, Federal (other than NRC) decisionmakers. If the operating licenses are not renewed, the plant will be shut down at or before the expiration of the current operating licenses for Unit 1 and Unit 2, which are July 31, 2014, and August 13, 2016, respectively.

Under NEPA (42 USC 4321-4370d), an EIS is required for major Federal actions significantly affecting the quality of the human environment. The NRC has implemented Section 102 of NEPA in 10 CFR Part 51. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor operating license; 10 CFR 51.95(c) states that the EIS prepared at the operating license renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS),^(a) NUREG-1437 (NRC 1996, 1999a).

Upon acceptance of the BGE application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a notice of intent to prepare an environmental impact statement and conduct scoping (63 FR 31813). The staff visited the CCNPP site in July 1998 and held public scoping meetings on July 9, 1998, in Solomons, Maryland (NRC 1998). The staff reviewed the GEIS and the BGE ER, consulted with other agencies, and conducted an independent review of the issues following the guidance set forth in the draft *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 1999b).

The staff then issued a draft of the SEIS for public comment on February 24, 1999, which contained the preliminary results of its evaluation and recommendation. In addition, the staff held two public meetings during the comment period for this report on April 6, 1999. When the comment period ended on May 20, 1999, the staff considered and dispositioned all of the comments received, as discussed in Appendix A of this report. Modifications were made to this report to address certain comments, where appropriate, as described in Appendix A.

This supplemental environmental impact statement (SEIS) presents the staff's analysis of the environmental impacts of renewal of the CCNPP operating licenses. The analysis considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and alternatives available for reducing or avoiding adverse impacts. It also includes the staff's final recommendation regarding the proposed action.

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

Summary and Conclusions

The Commission has set forth both the purpose and need for license renewal and the criterion to be used in evaluating the environmental effects of license renewal. The GEIS includes the following statement of purpose and need:

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 NRC) decisionmakers.

The criterion to be used in evaluating the environmental impacts, found in 10 CFR 51.95(c)(4) and in the GEIS, is as follows:

... 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 operating license.

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 operations—generic determination of no significant environmental impact"] and in accordance with §51.23(b).

In addition, the Commission has included detailed findings related to the Uranium Fuel Cycle and Waste Management in 10 CFR Part 51, Subpart A, Appendix B, Table B-1.

The GEIS contains the results of a systematic evaluation of the consequences of renewing an operating license and operating a nuclear power plant for an additional 20 years. It addresses 93 environmental issues using a three-level standard of significance—small, moderate, or large—based on Council on Environmental Quality guidelines.

These significance levels are:

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 93 issues considered in the GEIS, the analysis in the GEIS has shown:

- (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 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 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 classified in the GEIS as Category 1 issues. In accordance with 10 CFR 51.71(d), the staff relied on conclusions as amplified by supporting information in the GEIS for issues designated Category 1 in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 and, as described below, considered whether there was any significant new information relevant to the proposed action on these issues.

Of the 24 issues not meeting the criteria set forth above, 22 were classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. Environmental justice was not evaluated on a generic basis and must also be addressed in a plant-specific supplement to the GEIS. The remaining issue concerns the chronic effects of electromagnetic fields. Information on chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared. It is still not conclusive.

This SEIS documents the staff's evaluation of all 93 environmental issues considered in the GEIS and one new issue (microorganisms that live in high radiation, high-temperature conditions) raised during the scoping process. As set forth in this SEIS, the staff considered the environmental impacts associated with alternatives to license renewal and compares the environmental impacts of license

renewal and the alternatives. The alternatives to license renewal that are considered include no-action (not renewing the CCNPP operating licenses) and alternative methods of power generation. Among the alternative methods of power generation, coal-fired and gas-fired generation appear the most likely if the power from CCNPP is replaced. These alternatives are evaluated assuming that the replacement power generation plants are located at either the CCNPP site or an unspecified "greenfield" site.

9.1 Environmental Impacts of the Proposed Action—License Renewal

BGE and the staff have established independent processes for identifying and evaluating the significance of new information on the environmental impacts of license renewal. Neither BGE the staff has identified any significant new information related to Category 1 issues that would call into question the conclusions in the GEIS. Therefore, the staff relied upon the conclusions of the GEIS for the 69 Category 1 issues.

BGE's license renewal application presents analyses of the Category 2 issues. The staff has reviewed the BGE analysis for each issue and has conducted an independent review of each issue. Five Category 2 issues are not applicable to CCNPP because the issues are related to plant design features or site characteristics not found at CCNPP. Four additional Category 2 issues are not discussed in this SEIS because they are specifically related to refurbishment. BGE (1998) has stated that it "has not identified the need to undertake the major refurbishment activities that the GEIS assumed for license renewal, and no other modifications have been identified that would directly affect the environment or plant effluents."

The remaining 13 Category 2 issues, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in Chapters 3 through 7 of this SEIS. For all issues, the staff concludes that the potential environmental effects are of SMALL significance in the context of the GEIS. For SAMAs, the staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Although a limited number of cost-beneficial SAMAs were identified (four), these 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.

In addition to considering the 93 issues listed in the GEIS, the staff considered a potential issue associated with microorganisms that live in high radiation, high temperature conditions. The staff concludes that this issue, while new, is not significant.

Mitigation measures were considered for each Category 2 issue. In general, current measures to mitigate environmental impacts of plant operation were found to be adequate, and no additional mitigation measures were deemed sufficiently beneficial to be warranted.

The following subsections 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 at the construction permit stage 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 occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

Adverse impacts identified that are specific to CCNPP include the following:

- Assuming the current pumping rate, the additional drawdown of water at an offsite well during the renewal term attributable to CCNPP operation is estimated to be less than 2 m (5 ft).
- Continued operation of the CCNPP will result in continued loss of fish and shellfish due to entrainment and impingement despite mitigative measures instituted since plant construction. However, monitoring studies have demonstrated that impacts from these losses are small and are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
- The bounding estimate of an additional 60 employees at CCNPP may result in an increase of up to 4 percent in demand for housing and less than 1 percent in water demand and local traffic.

These adverse impacts are considered to be of SMALL significance, and none warrants implementation of additional mitigation measures. The adverse impacts of likely alternatives in the event that CCNPP ceases operation at or before the expiration of the current operating licenses will not be smaller than those associated with continued operation of CCNPP, 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 the CCNPP during its current license period was made when the plant was built. The resource commitments to be considered in this SEIS are associated with 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.

Summary and Conclusions

The most significant resource commitments related to operation during the renewal term are the fuel and the permanent storage space. The CCNPP requires approximately 88 fuel assemblies per year. Assuming no change in use rate, about 1760 spent fuel assemblies would be required for operation during a 20-year license renewal period.

The likely power generation alternatives in the event CCNPP ceases operation on or before the expiration of the current operating licenses will require commitment of resources for construction of 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 CCNPP site was set when the plants were approved and construction began. That balance is now well established. Renewal of the CCNPP operating licenses and continued operation of the plants will not alter the existing balance, but it may postpone the availability of the site for other uses. Denial of the application to renew the operating licenses will lead to shutdown of the plants and will alter the balance in a manner that depends on subsequent uses on the site. For example, the environmental consequences of turning the CCNPP site into a park or an industrial facility are quite different.

9.2 Relative Significance of the Environmental Impacts of License Renewal and the Alternatives

The proposed action is renewal of the operating licenses for Calvert Cliffs Nuclear Power Plant Units 1 and 2. Chapter 2 describes the CCNPP and the environment in the vicinity of the plant. Chapters 4 through 7 discuss environmental issues associated with renewal of the operating licenses.

Environmental issues associated with the No-Action alternative and alternatives involving power generation are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the operating licenses), the No-Action alternative (denial of the application), and alternatives involving coal- and gas-fired generation of power at the CCNPP site and a unspecified "greenfield site" are compared in Table 9-1. Continued use of the CCNPP once-through cooling system is assumed for Table 9-1. Substitution of a cooling tower for the once-through cooling system in the evaluation of the coal-fired and gas-fired generation alternatives would result in somewhat greater environmental impacts in some impact categories.

Table 9-1 shows that the significance of the environmental effects of the proposed action are SMALL for all impact categories. The alternative actions, including the No-Action alternative, may have environmental effects, in at least some impact categories, that reach MODERATE or LARGE significance.

Table 9-1. Summary of Environmental Significance of License Renewal, the No-Action Alternative, and Alternative Methods of Generation Assuming a Once-Through Cooling System

Impact Category	Proposed Action	No-Action Alternative	Coal-Fired Generation		Gas-Fired Generation	
	License Renewal	Denial of Renewal	CCNPP Site	"Greenfield Site"	CCNPP Site	"Greenfield Site"
Land Use	SMALL	SMALL	SMALL	MODERATE to LARGE	SMALL	SMALL to MODERATE
Ecology	SMALL	SMALL	SMALL	MODERATE to LARGE	SMALL	SMALL to MODERATE
Water Quality — Surface Water	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Quality — Groundwater	SMALL	SMALL	LARGE	SMALL to LARGE	SMALL	SMALL
Air Quality	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE
Waste	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	SMALL to LARGE	MODERATE	MODERATE	SMALL	SMALL
Aesthetics	SMALL	SMALL	MODERATE to LARGE	MODERATE to LARGE	SMALL to MODERATE	SMALL to MODERATE
Archaeological and Historical Resources	SMALL	SMALL to LARGE	SMALL	SMALL	SMALL	SMALL
Environmental Justice	SMALL	SMALL to MODERATE	MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to MODERATE

9.3 Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the *Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants*, NUREG-1437; (2) the ER submitted by BGE; (3) consultation with other Federal, State, and local agencies; (4) its own independent review; and (5) its consideration of public comments, the staff recommends that the Commission determine that the adverse environmental impacts of license renewal for Calvert Cliffs Nuclear Power Plant Unit 1 and Unit 2 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

9.4 References

10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 51.20, "Criteria for and identification of licensing and regulatory actions requiring environmental impact statements."

10 CFR 51.23, "Temporary storage of spent fuel after cessation of reactor operation—generic determination of no significant environmental impact."

10 CFR 51.71, "Draft environmental impact statement—contents."

10 CFR 51.95, "Postconstruction environmental impact statements."

10 CFR Part 51, Subpart A, Appendix B, Table B-1, "Environmental effect of renewing the operating license of a nuclear power plant."

10 CFR Part 54, "Requirements for renewal of operating license of a nuclear power plant."

63 FR 31813, "Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process." June 10, 1998.

Baltimore Gas and Electric (BGE). 1998. *Applicant's Environmental Report—Operating License Renewal Stage at Calvert Cliffs Nuclear Power Plant Units 1 and 2*. Docket Nos. 50-317 and 50-318. Lusby, Maryland.

National Environmental Policy Act of 1969, as amended, 42 USC 4321-4370d.

U.S. Fish and Wildlife Service (FWS). 1998. Letter from John P. Wolflin, FWS to Barth W. Doroshuk, BGE. "Endangered and Threatened Species Calvert Cliffs License Renewal." November 3, 1998.

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

U.S. Nuclear Regulatory Commission (NRC). 1998. *Environmental Impact Statement Scoping Process Summary Report, Calvert Cliffs Nuclear Power Plant Lusby, Maryland*. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999a. *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*. NUREG-1437, Vol. 1, Addendum 1. Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999b. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1. Washington, D.C.

Appendix A

Discussion of Comments on the Draft Supplement

Pursuant to 10 CFR Part 51, the staff transmitted the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Calvert Cliffs Nuclear Power Plant, Draft Report for Comment* (NUREG-1437, Supplement 1 (referred to as the Draft SEIS) to Federal, State, local government agencies, and 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 into the NRC Public Document Room and the NRC Local Public Document Room in Prince Frederick, Maryland;
- sent copies of the Draft SEIS to the applicant and certain Federal, State, and local agencies;
- published a notice of availability of the Draft SEIS in the Federal Register on March 5, 1999 (64 FR 10662);
- issued public announcements, such as advertisements in local newspapers and postings in public places, of the availability of the Draft SEIS ;
- announced and held two public meetings in Solomons, Maryland on April 6, 1999, to describe the results of the environmental review and answer related questions;
- issued press releases announcing the issuance of the Draft SEIS, the public meetings, and instructions on how to comment on the Draft SEIS; and
- established a website to receive comments on the Draft SEIS through the Internet.

During the comment period, the staff received a total of 17 comment letters and e-mail messages in addition to the comments and written statements received during the public meetings.

The staff has reviewed the public meeting transcripts and the 17 comment letters and e-mail messages that are part of the docket file for the application, all of which are available in the NRC Public Document Room. Excerpts of the transcripts that contained comments or questions are reproduced in this appendix along with the written statements submitted at the public meetings and each of the 17 comment letters and e-mail messages. Table A-1 lists (1) the speakers at the meetings in initial speaking order along with the page of the transcript excerpts in this report on which the comment

appears, and (2) the authors of the comment letters or e-mail messages. The staff response for each issue is provided in Section A.1 of this Appendix. Related issues have been grouped together.

The staff addressed each comment by considering whether it was:

- (1) a comment about a Category 1 issue, and whether it
 - (a) provided significant new information that required evaluation during the review or
 - (b) provided no new information;
- (2) a comment about a Category 2 issue, and whether it
 - (a) provided information that required evaluation during the review, or
 - (b) provided no such information;
- (3) a comment that raised an environmental issue not addressed in the GEIS or the Draft SEIS;
- (4) a comment on safety issues pertaining to 10 CFR Part 54; or
- (5) a comment outside the scope of license renewal (not related to 10 CFR Parts 51 or 54).

There was no significant new information on Category 1 issues [1(a) above]. If the comment provided new information for a Category 2 issue [2(a)], the staff evaluated the information and modified the SEIS, as appropriate. If the comment provided no new information for either Category 1 or 2 issues [1(b) or 2(b)], the GEIS and draft SEIS remained valid and bounding, and no further evaluation was performed.

Comments without a supporting technical basis or that did not provide any new information are addressed in this appendix, providing relevant references that address the issues within the regulatory authority of the NRC, where appropriate. These references can be obtained from the NRC Public Document Room.

Subsections A.1.1 through A.1.18 correspond generally to the subject matter in the text of the supplement (purpose and scope, conclusions, site description, refurbishment, ecology, human health, socioeconomics, archaeology and historic resources, postulated accidents, uranium fuel cycle and solid waste management, decommissioning, alternatives to the proposed action, and summary and conclusions). Within each section, 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 question resulted in a change in the text of the draft report, the corresponding response refers the reader to the appropriate section of this report where the change was made. All revisions to the text, whether substantive (including those made in response to comments) or editorial, are designated by vertical lines in the margin beside the text.

Section A.2 provides relevant portions of the public meeting transcripts, written statements submitted during the public meetings, and the 17 e-mail messages and letters received in response to the Draft SEIS. Each comment identified by the staff was assigned a specific alpha-numeric identifier (marker). That identifier is typed in the margin of the transcript, written statement, e-mail message, or letter at the beginning of the discussion of the comment. In addition, to assist the reader in finding the response to the comment, the section number(s) where the comment is addressed in Section A.1 of this report is also listed in the margin next to the identifier. A cross-reference of the alpha-numeric identifier, the speaker or author of the comment, the page of the report where this comment can be found, and the section(s) of this Appendix in which the comment is addressed is provided in Table A-1.

Table A-1. Calvert Cliffs SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A1	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-47	A.1.3
A2	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-47	A.1.3
A3	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-49	A.1.12
A4	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-49	A.1.12
A5	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-50	A.1.3
A6	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-50	A.1.3
A7	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-51	A.1.3
A8	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-51	A.1.3
A9	K. Dellinger	Afternoon Meeting Transcript (4/6/99)	A-52	A.1.3
A10	B. Doroshuk	Afternoon Meeting Transcript (4/6/99)	A-53	A.1.4
A11	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-53	A.1.7
A12	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-54	A.1.10
A13	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-54	A.1.10
A14	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-55	A.1.10
A15	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-55	A.1.6
A16	D. Lochbaum	Afternoon Meeting Transcript (4/6/99)	A-55	A.1.3, A.1.6
A17	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-56	A.1.3

Table A-1. Calvert Cliffs SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A18	Dr. J. Mihursky	Afternoon Meeting Transcript (4/6/99)	A-60	A.1.2
A19	Dr. J. Mihursky	Afternoon Meeting Transcript (4/6/99)	A-60	A.1.13
A20	Dr. J. Mihursky	Afternoon Meeting Transcript (4/6/99)	A-60	A.1.14
A21	Dr. J. Mihursky	Afternoon Meeting Transcript (4/6/99)	A-60	A.1.5
A22	Dr. J. Mihursky	Afternoon Meeting Transcript (4/6/99)	A-60	A.1.11
A23	Dr. J. Mihursky	Afternoon Meeting Transcript (4/6/99)	A-61	A.1.12
A24	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-61	A.1.6
A25	G. Abbe	Afternoon Meeting Transcript (4/6/99)	A-62	A.1.5
A26	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-64	A.1.3
A27	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-64	A.1.10
A28	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-65	A.1.10
A29	D. Hale	Afternoon Meeting Transcript (4/6/99)	A-65	A.1.1
A30	D. Hale	Afternoon Meeting Transcript (4/6/99)	A-66	A.1.1
A31	Dr. D. Rogers	Afternoon Meeting Transcript (4/6/99)	A-67	A.1.6
A32	Dr. D. Rogers	Afternoon Meeting Transcript (4/6/99)	A-68	A.1.6
A33	R. Mogel	Afternoon Meeting Transcript (4/6/99)	A-69	A.1.1
A34	G. Clark	Afternoon Meeting Transcript (4/6/99)	A-69	A.1.1
A35	A. Howard	Afternoon Meeting Transcript (4/6/99)	A-70	A.1.1
A36	T. Allhoff	Afternoon Meeting Transcript (4/6/99)	A-72	A.1.1
A37	T. Rockwell	Afternoon Meeting Transcript (4/6/99)	A-74	A.1.6
A38	D. Graf	Afternoon Meeting Transcript (4/6/99)	A-75	A.1.1
A39	C. McHugh	Afternoon Meeting Transcript (4/6/99)	A-77	A.1.1
A40	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-78	A.1.3
A41	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-78	A.1.10

Table A-1. Calvert Cliffs SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A42	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-78	A.1.10
A43	J. Riccio	Afternoon Meeting Transcript (4/6/99)	A-79	A.1.10
A44	D. Jenkins	Afternoon Meeting Transcript (4/6/99)	A-80	A.1.1
A45	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-81	A.1.13
A46	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-81	A.1.3, A.1.13
A47	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-82	A.1.5
A48	P. Gunter	Afternoon Meeting Transcript (4/6/99)	A-82	A.1.6
A49	C. Reynolds	Afternoon Meeting Transcript (4/6/99)	A-83	A.1.1
A50	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-84	A.1.2, A.1.10
A51	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-85	A.1.10
A52	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-85	A.1.12
A53	R. Mills	Afternoon Meeting Transcript (4/6/99)	A-86	A.1.11
A54	K. Dellinger	Afternoon Meeting Transcript (4/6/99)	A-87	A.1.2
A55	K. Dellinger	Afternoon Meeting Transcript (4/6/99)	A-87	A.1.2, A.1.9
A56	K. Dellinger	Afternoon Meeting Transcript (4/6/99)	A-87	A.1.2
A57	K. Dellinger	Afternoon Meeting Transcript (4/6/99)	A-87	A.1.2, A.1.3
A58	B. Doroshuk	Afternoon Meeting Transcript (4/6/99)	A-89	A.1.3
A59	B. Doroshuk	Afternoon Meeting Transcript (4/6/99)	A-91	A.1.15
A60	L. Kelly	Evening Meeting Transcript (4/6/99)	A-93	A.1.1
A61	L. Kelly	Evening Meeting Transcript (4/6/99)	A-94	A.1.1
A62	G. Klein	Evening Meeting Transcript (4/6/99)	A-95	A.1.1
A63	D. Jenkins	Evening Meeting Transcript (4/6/99)	A-96	A.1.1
A64	A. Howard	Evening Meeting Transcript (4/6/99)	A-97	A.1.1

Table A-1. Calvert Cliffs SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
A65	Mr. Tenore	Evening Meeting Transcript (4/6/99)	A-97	A.1.1
A66	B. Doroshuk	Evening Meeting Transcript (4/6/99)	A-98	A.1.1
B1	Dr. J. Mihursky	Written Statement Submitted at Public Meetings (4/6/99)	A-101	A.1.2
B2	Dr. J. Mihursky	Written Statement Submitted at Public Meetings (4/6/99)	A-101	A.1.13
B3	Dr. J. Mihursky	Written Statement Submitted at Public Meetings (4/6/99)	A-101	A.1.14
B4	Dr. J. Mihursky	Written Statement Submitted at Public Meetings (4/6/99)	A-101	A.1.5
B5	Dr. J. Mihursky	Written Statement Submitted at Public Meetings (4/6/99)	A-102	A.1.11
B6	Dr. J. Mihursky	Written Statement Submitted at Public Meetings (4/6/99)	A-102	A.1.12
B7	ANS Position Statement on Nuclear Power: The Leading Strategy for Reducing Carbon Emissions	Written Statement Submitted at Public Meetings (4/6/99)	A-103	A.1.1
B8	A. Howard	Written Statement Submitted at Public Meetings (4/6/99)	A-111	A.1.1
B9	A. Howard	Written Statement Submitted at Public Meetings (4/6/99)	A-111	A.1.1
B10	A. Howard	Written Statement Submitted at Public Meetings (4/6/99)	A-111	A.1.1
B11	B. Doroshuk	Written Statement Submitted at Public Meetings (4/6/99)	A-114	A.1.3
B12	B. Doroshuk	Written Statement Submitted at Public Meetings (4/6/99)	A-115	A.1.15
C	G. R. Mazetis	March 2, 1999 Letter	A-122	A.1.11

Table A-1. Calvert Cliffs SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
D	G. Abbe	February 25, 1999 E-mail Message	A-123	A.1.18
E1	S. W. Samuels	March 8, 1999 E-mail Message	A-124	A.1.15
E2	S. W. Samuels	March 8, 1999 E-mail Message	A-124	A.1.13
E3	S. W. Samuels	March 8, 1999 E-mail Message	A-124	A.1.10
E4	S. W. Samuels	March 8, 1999 E-mail Message	A-124	A.1.9
F	T. S. Smith	March 18, 1999 Letter	A-124	A.1.11
G	S. W. Samuels	April 2, 1999 E-mail Message	A-126	A.1.15
H	L. R. Romo	April 9, 1999 E-mail Message	A-127	A.1.2
I	B. Larcom	April 10, 1999 E-mail Message	A-127	A.1.2
J	J. Bryne	April 12, 1999 E-mail Message	A-128	A.1.2
K1	D. Lochbaum	April 12, 1999 Letter	A-128	A.1.3
K2	D. Lochbaum	April 12, 1999 Letter	A-129	A.1.3, A.1.6
L1	R. Mills	May 4, 1999 Letter	A-130	A.1.3
L2	R. Mills	May 4, 1999 Letter	A-130	A.1.10
L3	R. Mills	May 4, 1999 Letter	A-130	A.1.15
L4	R. Mills	May 4, 1999 Letter	A-130	A.1.3
L5	R. Mills	May 4, 1999 Letter	A-131	A.1.6
L6	R. Mills	May 4, 1999 Letter	A-131	A.1.12
L7	R. Mills	May 4, 1999 Letter	A-131	A.1.12
L8	R. Mills	May 4, 1999 Letter	A-131	A.1.11, A.1.12
L9	R. Mills	May 4, 1999 Letter	A-131	A.1.12
L10	R. Mills	May 4, 1999 Letter	A-132	A.1.12
M	J. R. Lemon for C. H. Cruse	April 27, 1999 Letter	A-132	A.1.16

Table A-1. Calvert Cliffs SEIS Comment Log

No.	Speaker or Author	Source	Page of Comment	Section(s) Where Addressed
N	J. S. Stahl	May 11, 1999 E-mail Message	A-133	A.1.16
O	K. R. McAllister	May 8, 1999 Letter	A-133	A.1.1
P	A. B. Brownstein	May 18, 1999 Letter	A-134	A.1.16
Q1	R. I. McLean	May 19, 1999 Letter	A-136	A.1.5
Q2	R. I. McLean	May 19, 1999 Letter	A-136	A.1.6
Q3	R. I. McLean	May 19, 1999 Letter	A-136	A.1.15
Q4	R. I. McLean	May 19, 1999 Letter	A-137	A.1.18
R	C. H. Cruse	May 19, 1999 Letter	A-139	A.1.4, A.1.8, A.1.16, A.1.17, A.1.18 Table A-2
S1	R. I. McLean	May 20, 1999 Letter	A-149	A.1.5
S2	R. I. McLean	May 20, 1999 Letter	A-149	A.1.5
T	L. S. Bradshaw	June 25, 1999 Letter	A-149	A.1.16

A.1 Comments and Responses

A.1.1 General Comments In Support of License Renewal

The record of the public meetings and comment letters contains 22 comments that express general support for CCNPP license renewal (A29, A30, A33, A34, A35, A36, A38, A39, A44, A49, A60, A61, A62, A63, A64, A65, A66, B7, B8, B9, B10, O). Common reasons for supporting license renewal included:

- BGE's environmental stewardship (A33, A36, A61, A63, B7);
- economic benefits to the community and hardship if shut down (A30, A39, A49, A63, B9);
- social benefit to the community through the activities of CCNPP employees (A30, A44, A49, A60);
- air quality (A35, A38, A61, A64, B7, B8, O); and
- high replacement costs (B10).

These comments are general in nature and do not provide new information. Therefore, no further evaluation was required, and no changes to the SEIS were made as a result of these comments.

A.1.2 General Comments In Opposition to License Renewal

The record includes ten comments that express general opposition to nuclear power and license renewal (A18, A50, A54, A55, A56, A57, B1, H, I, J). Reasons for opposing license renewal include

- unacceptably high risk of accidents (A18, A50, A56, B1, I, J);
- availability of more benign power generation alternatives (A18, A56, B1, H);
- nuclear waste (A54, A57, H); and
- health concerns (A55, A56).

These comments are general in nature, and do not provide new information. Therefore, no further evaluation was required, and no changes to the SEIS were made as a result of these comments.

A.1.3 License Renewal Review Process

The record contains 18 comments and questions related to the license renewal process (A1, A2, A5, A6, A7, A8, A9, A16, A17, A26, A40, A46, A57, A58, B11, K1, K2, L1, L4). Two comments (A58, B11) describe the open nature of the review process. The other comments take issue with various aspects of the review process. Common themes in the adverse comments and questions related to the license renewal process include

- limitations on public input (A6, A7, A8);
- changes in the process (A2, A17, A26, A40);
- limitations on scope (A16, A46, K2, L4);
- adequacy of the BGE application (A5, L1);
- lack of objectivity of the staff evaluation (K1); and
- other (A9, A57).

The adequacy of the license renewal review process is not within the scope of the environmental review related to CCNPP license renewal. It was established by rulemaking that included public notice and comment. Any new challenge to the process is outside the scope of this plant-specific environmental review.

The specific adverse comments are addressed below.

Comment:

Three of the adverse comments (A6, A7, A8) deal with limitations on public input. Two of the comments (A6, A7) suggest that one opportunity for public hearing has been dropped from the process, and the third comment (A8) states that the public only has 30 days to review a document that the NRC estimates will take 22 man-years to review.

Response:

The license renewal process involves separate environmental and safety reviews, which together account for the 22 Full-Time Equivalents (FTEs) estimated for the NRC review. This SEIS is part of the environmental review. Environmental reviews are conducted at various stages of plant construction and operation. The staff conducted an environmental review for CCNPP at the operating license stage, during which the draft environmental statement was available for comment. This environmental review is being conducted at the license renewal stage. In the review process for license renewal, the public had opportunities to participate in the scoping process and in review of the draft SEIS.

The public had access to the license renewal application shortly after it was docketed. A 60-day scoping period during which comments were solicited began approximately one month after the application was docketed, and a scoping meeting for the CCNPP environmental review occurred about one month later. The draft SEIS was published approximately nine months after docketing, after which a 75-day opportunity for comment was provided.

These comments did not result in modification of the SEIS text.

Comment:

There were three comments or questions (A1, A2, A17) related to changes in the environmental review process. These concerned the status and background behind the change in classification of high-level waste transportation from a Category 2 issue to a Category 1 issue. There were two other comments (A26, A40) that asserted that there was an earlier application for license renewal that caused the NRC to change the license renewal process to ensure renewal of the license.

Response:

The NRC addressed the questions concerning the status and background behind the change in classification of high-level waste transportation from a Category 2 issue to a Category 1 issue at the April 6, 1999, public meeting. The staff indicated that the proposed rule was an NRC initiative. The draft SEIS addressed this issue in Section 6.1.1, "Transportation of Radiological Waste," because the rule had not been finalized. Now that the rule has been amended, as discussed below, the issue is a Category 1 issue. Section 6.1 of this report now reflects this reclassification.

The Commission revised its environmental protection regulations (10 CFR Part 51) for license renewal on December 18, 1996 (61 FR 66537). The amendment was based on the analyses and conclusions reported in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS)(May 1996). In response to the comments received on a version of the rule published on June 5, 1996 (61 FR 28467), the Commission made the following statement:

As part of its effort to develop regulatory guidance for this rule, the Commission will consider whether further changes to the rule are desirable to generically address: (1) the issue of cumulative transportation impacts and (2) the implications that the use of

higher burnup fuel have for the conclusions in Table S-4. After consideration of these issues, the Commission will determine whether the issue of transportation impacts should be changed to a Category 1.

In SECY-97-279, entitled "Generic and Cumulative Environmental Impacts of Transportation of High-Level Waste (HLW) in the Vicinity of a HLW Repository," dated December 3, 1997, the NRC staff informed the Commission that it was the staff's preliminary view that the supplemental analyses of the generic and cumulative impacts of the transportation of HLW and of the implications of higher fuel burnup for transportation impacts supports a reasonable technical and legal determination that transportation of HLW is a Category 1 issue and may be generically resolved and adopted in a license renewal application. In a Staff Requirements Memorandum (SRM) dated January 13, 1998, the Commission directed the NRC staff to proceed with rulemaking to amend 10 CFR 51.53(c)(3)(ii)(M) to categorize the impacts of transportation of HLW as a Category 1 issue. In a memorandum dated July 1, 1998, the NRC staff informed the Commission of its plans for amending 10 CFR Part 51.

The Commission published the proposed rule for a 60-day public comment period on February 26, 1999 (64 FR 9884). The Commission also published a notice of availability of NUREG-1437, Vol. 1, Addendum 1, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants: Main Report Section 6.3 - 'Transportation,' Table 9.1 'Summary of findings on NEPA issues for license renewal of nuclear power plants,' Draft for Comment," (February 1999) (64 FR 9889) (Addendum 1 to the GEIS). Although the public comment period for the proposed rule and the draft Addendum to the GEIS ended on April 27, 1999, in response to concerns expressed by stakeholders about the length of the comment period, in developing the final rule and final version of Addendum 1 to the GEIS, the staff considered comments dated as late as June 25, 1999, and received in early July 1999.

In the SRM to SECY-99-202, "Final Rule - Changes to Requirements for Environmental Review for Renewal of Nuclear Power Plant Operating Licenses (10 CFR Part 51)," dated August 3, 1999, the Commission approved issuance of the final rule and release of the supporting Addendum 1 to the GEIS. The Commission revised the environmental protection regulations on September 3, 1999, (64 FR 48496) and the rule became effective on October 4, 1999. The notice of filing of the Final Addendum 1 to the GEIS was published on September 17, 1999 (64 FR 50507).

CCNPP is the first U.S. nuclear power plant to undergo the NRC license renewal process under NRC's 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," with regard to the renewal of nuclear power plant operating licenses. The licensee of Yankee Rowe considered applying for renewal of its operating license but discovered significant safety problems in the initial phases of its investigation and terminated the action. The Yankee Rowe decision has not affected the license renewal process.

These comments did not result in modification of the SEIS text. However, the text of the SEIS has been changed to be consistent with the final rule.

Comment:

There were four adverse comments (A16, A46, K2, L4) related to limitations placed on the scope of the environmental review. All of these comments contain explicit or implicit objections to reliance upon the GEIS determination for Category 1 issues in the absence of significant new information, and two comments (A46, L4) specifically mention high-level waste issues, which are Category 1 issues.

Response:

The environmental review process, which is set forth in 10 CFR Part 51, implements the National Environmental Policy Act of 1969 (NEPA). It provides for public notice, public input on the scope of the review, and public comment on the environmental analysis. In 10 CFR 51.95(c)(4), the Commission states that the NRC staff, adjudicatory officers, and the Commission shall integrate the conclusions regarding the environmental acceptability of the license renewal action, as amplified by the supporting information in the GEIS for issues designated as Category 1 (with certain exceptions) or resolved as Category 2, information developed for those open Category 2 issues applicable to the plant in accordance with 10 CFR 51.53(c)(3)(ii), and any significant new information. Accordingly, it should not be necessary to review a Category 1 issue in the context of an individual application unless there is significant new information on the issue.

The environmental review process provides for the preparation of generic environmental impact statements to avoid the time and expense of repeated reviews of essentially the same material. When an environmental issue has been resolved generically, there is no need to conduct another detailed review of the same issue with respect to a particular application unless there is significant new information related to some aspect of the issue. The GEIS addresses and draws generic conclusions on 69 environmental issues associated with license renewal. These are the Category 1 issues.

BGE's review of Category 1 issues (listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1) is limited to the search for and evaluation of significant new information. If the staff finds significant new information regarding a specific Category 1 issue, reconsideration of the conclusions on that issue is limited in scope to assessment of the relevant new and significant information. The scope of the assessment does not include review of other facets of the issue that are not affected by the new information.

Both the BGE staff and the NRC staff implemented processes for reviewing information related to the issues generically dispositioned in the GEIS and did not find any significant new information with respect to any Category 1 issue. In addition, there was no significant new information received during the comment period from members of the public. Consequently, in this document, which is a supplement to the GEIS, the staff relies on the analysis and conclusions in the GEIS for those issues.

This document also addresses those issues that require plant-specific evaluation. It includes more detailed information on issues that required plant-specific evaluation, such as the effects of CCNPP

operation on the aquatic environment, rather than on issues for which a generic determination was made in the GEIS, such as the effects of operation on human health.

These comments did not result in modification of the SEIS text.

Comment:

Two comments (A5, L1) contain assertions that the BGE application was incomplete and inaccurate. One of these comments (A5) cited supplements to the application as an indication that an incomplete and inaccurate report was submitted by BGE. The other comment (L1) asserts that the BGE application fails to justify the need for power 15 years from now.

Response:

The BGE application was reviewed upon receipt by the NRC staff. The staff determined that the application was complete and acceptable for docketing purposes. Since the initial review of the application, the staff has continued the review, conducted a site visit, and held public meetings with BGE on various subjects covered in the application. As a result of these additional interactions, the staff identified areas where additional information was needed for its review. Appendix C lists the correspondence in which NRC has requested and BGE has provided this additional information. The staff's requests for additional or clarifying information does not imply that the application was incomplete when docketed. Rather, the requests for additional information reflect the normal interchange that occurs whenever a large and complex evaluation is submitted for review.

In accordance with 10 CFR 51.95(c)(2), neither BGE or the NRC is required to evaluate the need for power in connection with the environmental review associated with license renewal. The Commission has set forth the need for the proposed NRC action in the GEIS. It is:

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 NRC) decisionmakers.

These comments did not result in modification of the SEIS text.

Comment:

The record contains two additional comments related to the licensing process (A9, A57). One of these comments (A9) contained a question related to petitioning to close CCNPP, and the other (A57) contained a request to NRC to immediately develop a process to deny license extensions to nuclear power plants.

Response:

NRC regulations [in 10 CFR 2.206(a)] provide: "Any person may file a request to institute a proceeding pursuant to § 2.202 to modify, suspend, or revoke a license, or for other such action as

may be proper." The regulations continue, stating that "[t]he requests shall specify the action requested and set forth the facts that constitute the basis for the request." The license for CCNPP is subject to the provisions of 10 CFR 2.206.

The NRC staff considers license renewal applications under 10 CFR Parts 51 and 54. The outcome of the NRC's review is not pre-determined. An applicant must comply with the NRC's regulations; otherwise the application will be denied. The processes in 10 CFR Parts 2, 51, and 54 provide for both granting and denying applications to renew licenses for nuclear power reactors.

These comments did not result in modification of the SEIS text.

Comment:

One comment (K1) asserts that the draft SEIS appears to be unfairly biased, stating that the staff's acceptance of the Commission's Waste Confidence Rule [10 CFR 51.23(a)] demonstrates a willingness to accept uncertain and unproven technology on the one hand, while failing to accept energy technologies represented by renewable energy sources as a viable replacement of the power produced by CCNPP on the other.

Response:

The Commission has established a process separate from the license renewal review process for addressing the issue of a high-level waste repository for storing spent fuel generated by reactors in the United States. During the promulgation of 10 CFR 51.23 (the Waste Confidence Rule) in 1990, the Commission stated that it would review its Waste Confidence Rule every 10 years (rather than every five years as provided in the 1984 rulemaking)(55 FR 38475). Challenges or comments on the rule will be considered when the Commission reconsiders its Waste Confidence Rule.

During the promulgation of 10 CFR 51.23, the Commission considered the technical feasibility of constructing and operating a high-level waste repository. The rulemaking also included the opportunity for public comment. The basis for the Waste Confidence Rule, including the periodic reconsideration by the Commission, can be found in the rulemaking records [55 FR 38474 (September 18, 1990) and 49 FR 34694 (August 31, 1984)].

In the context of an environmental review, the staff considers the energy source alternatives available at the time it is evaluating the application to renew the license. The staff assesses technically feasible alternatives and discloses their environmental impact. Because facilities that use renewable energy sources are currently limited to small capacities, the staff does not consider them capable of replacing large baseload units, such as CCNPP, at this time. However, that determination does not preclude such renewable energy sources from being used to replace CCNPP in the future. The staff has made no determination that renewable energy sources cannot be viable replacement options for large baseload units in the future, nor is it presuming that renewable technologies will not be available in the future. The decision to continue CCNPP operation or replace that power source with other economically and environmentally viable technologies is not within the purview of the NRC, and is left to State, utility, and, where authorized, Federal (other than the NRC) decisionmakers.

The Waste Confidence Rule is supported by the above cited rulemaking records. In contrast, the use of renewable energy sources as a replacement energy source for CCNPP at this stage of development is not supported by a similar body of information (nor does the comment provide such information). Accordingly, these matters have been considered given the information available at this time.

This comment did not result in modification of the SEIS text.

A.1.4 Refurbishment

The record contains two comments related to refurbishment made by BGE (A10, R79). The first comment (A10), made by BGE during the public meeting on the afternoon of April 6, 1999 stated that there would be no refurbishment that would affect anything outside the perimeter of the power plant. The second comment (R79) contained in the May 19, 1999, letter from BGE reaffirmed its position stated in the ER that BGE "has not identified the need to undertake the major refurbishment activities that the GEIS assumed for license renewal, and no other modifications have been identified that would directly affect the environment or plant effluents."

These comments provide clarification of BGE's position on refurbishment. They do not change information that BGE provided in the application. However, the staff revised Section 2.1.6 and 2.2 of this report for clarity.

A.1.5 Ecology

The record contains seven comments related to ecology (A21, A25, A47, B4, Q1, S1, S2). One comment (A25) describes studies on fish and shellfish in the Bay, and two comments (Q1, S1) provided additional information on fisheries valuation, special species status, and critical habitats. New information on fisheries valuation, special species status, and critical habitats included in these comments has been incorporated in Chapters 2 and 4. Additional species of concern were included in Section 2.2.6, and Section 4.1.2 was expanded to include the new fisheries valuation data. This additional information did not affect the conclusions of the staff.

Specific comments are addressed below.

Comment:

One comment (S2) concerned consultations with the Maryland Department of Natural Resources (MDNR). The MDNR noted that the forested area on the project contains potential Chesapeake Bay Critical Area Forest Interior Dwelling Bird Habitat and that consultation with MDNR is required.

Response:

BGE's letter to the MDNR dated August 17, 1999, documents BGE's consultations with MDNR regarding potential impacts to the Chesapeake Bay Critical Area Forest Interior Dwelling Bird Habitat associated with renewal of the CCNPP operating licenses. BGE stated that, as outlined in the ER accompanying the CCNPP license renewal application, the anticipated activities of the

proposed action (license renewal of CCNPP) would take place within existing structures and facilities. No additional land disturbances or structural modifications are expected for the purpose of supporting license renewal. Therefore, BGE expects that operation of the plant through the license renewal period (an estimated 20 years) would not impact the Critical Area or potential interior forest dwelling bird habitat located within site boundaries.

This comment did not result in modification of the SEIS text.

Comment:

Three comments (A21, A47, B4) included questions about the effects of radiological releases to the environment. Two of the comments (A21, B4) question whether the biological effects of batch releases of tritium to the Chesapeake Bay have been considered in the SEIS. The other comment (A47) states that CCNPP has released about 150,000 Ci to the environment, and asks the NRC to produce studies that show safe [radiation] thresholds and include them in the GEIS.

Response:

Any releases of tritium to the environment are monitored and evaluated through the CCNPP Radiological Environmental Monitoring Program. The staff reviewed the CCNPP Annual Reports for the last five years and found the levels of releases of all radionuclides (including tritium) remained within NRC release limits. NRC limits are set to ensure protection of human health, which, based on extensive data, is assumed to be protective of all other biological receptors (animals and plants). Effects of radiation exposure on human health from all environmental releases have been extensively evaluated in the GEIS and have been classified as a Category 1 issue with no significant impact. Operational monitoring data have shown all emissions are well below those that could cause health effects on humans. See Section A.1.6 of this report for further discussions of the effects of radiation exposure on human health.

These comments did not result in modification of the SEIS text.

A.1.6 Human Health

There are ten comments in the record related to human health (A15, A16, A24, A31, A32, A37, A48, K2, L5, Q2). The staff's responses to these comments follow.

Comment:

Three of the comments (A31, A32, A37) take the position that the health effects of low-level radiation have not been shown to be adverse. The results of studies of cancer incidence in the vicinity of the nuclear facilities are cited in comments A31 and A32. The National Cancer Institute study cited in comment A31 compared cancer before and after startup in the vicinity of 62 nuclear facilities and did not find higher risks of leukemia and other cancer after reactor startup. The study cited in comment A32 was more specific to the CCNPP area. Incidences of cancer near the plant were no greater than in the State, as a whole. Comment Q2 agrees with the staff position that

evidence related to health effects of chronic exposure to extremely low frequency-electromagnetic radiation is inconclusive at this time.

Response:

None of these comments required modification of the SEIS. However, Section 4.2.2 on the chronic effects of electromagnetic fields has been modified to include the findings of a recent National Institute of Environmental Health Sciences report that characterizes the scientific evidence linking electromagnetic fields to leukemia as weak and states "[i]n our opinion, this finding is insufficient to warrant aggressive regulatory concern."

Comment:

Two comments (K2, L5) state that the SEIS fails to properly consider the effects of normal operation on human health. In one case, the statement is based on differences in treatment of human health and aquatic ecology in the SEIS, and in the other, the statement is based on accumulation of activation products during the renewal term.

Response:

The radiation effects of normal reactor operation on human health are Category 1 issues. Based on the analysis in the GEIS, the Commission made a generic determination that the radiation effects of normal reactor operation during the renewal term on human health would be SMALL. The staff has not identified any significant new information related to the radiation aspects of human health in the ER, the scoping process, its independent review, or in either comment that would call the conclusions in the GEIS into question. Therefore, the staff relies on these conclusions as amplified by supporting information in the GEIS related to the radiation effects of normal operation during the renewal term on human health.

According to the GEIS, the components affected by neutron activation during reactor operation include the reactor internals and the biological shield. External components are not activated. BGE has stated that it does not intend major refurbishment activities. Consequently, the dose from activation products during normal operations in the renewal term will be negligible. Doses from activation products during decommissioning are considered explicitly in Chapter 7 of the GEIS. According to the GEIS:

Extending operations to 60 years would not increase the shutdown radioactivity level of either a PWR or BWR to any appreciable extent. This is because most of the radioactivity at shutdown results from short-half-life radionuclides, such as ^{60}Co , that are already in equilibrium by the time 40 years of operations have transpired. ... Gamma-emitting ^{94}Nb is the most important long-half-life radionuclide with regard to producing external radiation exposure. Based on Figure 7.4 [of the GEIS], it can be determined that at shutdown ^{94}Nb contributes less than 0.001 percent of the total potential dose. Even though 20 additional years of operation would increase the amount of ^{94}Nb by 50 percent, it would not increase its contribution to the dose much above 0.001 percent.

The staff has addressed the human health issues [acute effects of electromagnetic fields (Section 4.2.1) and chronic effects of electromagnetic fields (Section 4.2.2)] applicable to CCNPP that are not Category 1 issues to reflect the status of its review to the extent required by the Commission's regulations. A third Category 2 issue [Microbiological organisms (public health)(Appendix F)] was determined not to be applicable to CCNPP because this issue concerned heat dissipation systems that are not installed at CCNPP and bodies of water much smaller than the Chesapeake Bay.

The staff reviewed the Category 2 aquatic ecology issues concerning the radiological effects of CCNPP to determine whether there will be bioaccumulation of radioisotopes that could become part of the ingestion pathway leading to man. The staff performed a detailed review to determine whether station operation resulted in adverse effects on aquatic ecology, which could result in adverse human health effects through this ingestion pathway.

Category 2 aquatic ecology issues concerning the non-radiological effects of CCNPP on important biota, such as heat, impingement, and entrainment, were assessed in compliance with NEPA, which requires disclosure of those impacts.

The SEIS treats the effect of normal operation of CCNPP on the more site-specific aquatic ecology (a Category 2 issue) in more detail than that of the radiation effects of normal operation on human health (a Category 1 issue) because the plant's effect on human health has already been addressed in detail in the GEIS, and no significant new information has been found to call into question the conclusions in the GEIS.

These comments do not provide any significant new information regarding the effects of radiation exposure on human health, which are Category 1 issues. Therefore, these comments did not result in modification of the SEIS text.

Comment:

Four comments (A15, A16, A24, A48) take the position that the operation of nuclear power plants has adverse effects on human health. Comment A16 expresses concern that the health of shellfish was considered in more detail than the health of humans. Comment A15 questions whether there are studies that show that humans living around the plants are not dying earlier because of radiation releases. The other two comments (A24, A48) cite studies that indicate that operation of nuclear power plants may be associated with increased incidences of cancer.

Response:

The radiation effects of normal reactor operation on human health are Category 1 issues, as explained in the previous response. Published radiation standards are used to determine permissible levels. The Commission has concluded that the impacts from radiological releases that do not exceed permissible levels in the Commission's regulations are small.

Radiation standards reflect extensive scientific study by national and international agencies and are conservative to ensure that the public and those working at nuclear plants are protected. The NRC radiation exposure standards are presented in 10 CFR Part 20.

Radioactive emissions from a nuclear power plant are consistently very low. BGE continually monitors the levels of releases at the site to ensure that the releases stay well within NRC release limits. The effluent limits for nuclear power plants are constantly being reviewed and challenged as new studies are completed. NRC continually reviews new studies to identify new insights concerning health effects and incorporate new knowledge into radiological protection standards.

Numerous scientifically designed, peer-reviewed studies of personnel exposed to U.S. occupational levels of radiation for years (versus life threatening accident doses or medical therapeutic levels) have not shown any but the slightest effect on human health, and these effects were from exposures well above the exposure levels of the typical member of the general public from normal operation of a nuclear power plant. The UCLA study cited in comment A24 is currently being reviewed by the scientific community. The appropriateness of the statistical methods used for this type of epidemiological study are under evaluation. Whether the results of this study have validity will be determined after rigorous analysis, including peer review.

BGE will continue to be required to meet NRC radiation standards during the renewal term. These comments did not provide any significant new information regarding the radiation effects of normal operation on human health, which is a Category 1 issue. Therefore, these comments did not result in modification of the SEIS text.

A.1.7 Socioeconomics

The record contains one comment on socioeconomics (A11). The comment is addressed below.

Comment:

The comment (A11) asks if the socioeconomic analysis of the effects of license renewal (with particular reference to public transportation) included the effects of both the additional employees and the increase in population attributable to the additional employees.

Response:

The staff considered both direct and indirect impacts in the SEIS, including public transportation. However, BGE has clearly stated that it does not expect to hire additional employees for operation during the renewal term and that the 60 worker estimate (from the GEIS) is used as an upper bound or maximum. The maximum resulting associated household and population increases in the three-county area of Southern Maryland was estimated at 223 households (revised from 192 in the draft SEIS), and about 643 people in the two counties nearest the plant (St. Mary's and Calvert Counties). Neither the maximum increase in direct commuter traffic (60 plant employees) or the general increase in traffic due to an increase in population of less than 1% (643 people) is likely to be noticeable and, therefore, any impact would be small.

Although this comment did not directly result in modification of the SEIS text, the estimated number of households and residents was updated. Additionally, the SEIS text has been modified to clarify that BGE does not intend to hire additional employees and that the increase in employees and resulting increase in population discussed in the SEIS are upper bounds.

A.1.8 Archaeology and Historic Resources

The record contains only one comment related to archaeology and historic resources (R113). That comment is addressed below.

Comment:

BGE states that the following paragraph in Section 4.4.5 of the Draft SEIS is unsubstantiated and should be removed (R113)

Because there is a distinct possibility that undiscovered and/or unrecorded prehistoric and historic period archaeological sites exist in the 2300-acre plant site, as well as currently undocumented historic structures, additional care must be taken during normal operation or maintenance to ensure that cultural resources are not inadvertently impacted. These activities may include not only operation of the plant itself but also land management-related actions such as farming, recreation, wildlife habitat enhancement, or maintaining/upgrading access roads throughout the plant site.

Response:

This statement was not intended to be binding on BGE. Rather, it was intended to encourage BGE to exercise care in identifying cultural resources that could be affected should BGE decide to undertake activities involving land disturbances or structural modifications, and which BGE does not now plan, as stated in the application. Accordingly, the statement has been clarified in the SEIS text to address BGE's concerns.

A.1.9 Impacts of Mining, Milling, and Fuel Manufacture

The record contains two comments related to the impacts of uranium mining, milling, and fuel manufacture (A55, E4). The staff's response to these comments follow.

Comment:

One comment (A55) supports a statement that nuclear power is unsuitable for a society to use to produce energy by referring to the deaths of uranium miners from cancer. The other comment (E4) states that "[i]t is not possible to ignore the locally-located nationally distributed impacts of the national burden of continued uranium mining, milling, and fuel rod manufacture."

Response:

The impacts from the uranium fuel cycle, which includes the occupational exposures to uranium miners and all workers for all phases of the fuel cycle, were evaluated in the GEIS. Given the available information, the Commission concluded in Section 6.2.4 of the GEIS that, other than for the disposal of spent fuel and high-level waste, the impacts on individuals will be below regulatory limits, and therefore, the impacts from the uranium fuel cycle would be SMALL and is a Category 1 issue.

These comments did not provide any significant new information regarding the impacts from the uranium fuel cycle on human health. Therefore, they did not result in modification of the SEIS text.

A.1.10 Severe Accident Mitigation Alternatives

The record includes twelve comments related to severe action mitigation alternatives (SAMAs) (A12, A13, A14, A27, A28, A41, A42, A43, A50, A51, E3, L2). These comments generally fall into four groups. The first group contains a single comment (A14) that questions whether the effects of accidents are considered environmental effects. The second group, which also contains a single comment (E3), deals with dose calculations used in the evaluation of SAMAs. The third group contains four comments (A12, A13, A50, L2) related to core damage probabilities, and the fourth group contains six comments (A27, A28, A41, A42, A43, A51) related to the timing of improvements associated with cost-effective SAMAs. These comments are addressed below.

Comment:

Comment A14 questions whether the effects of accidents are considered environmental effects.

Response:

The effects of accidents are considered in both environmental and safety reviews for license renewal. In evaluating the renewal application for the environmental effects of accidents at Calvert Cliffs, the staff relied on the conclusions and supporting information in the GEIS related to the effects of design basis and severe accidents.

Chapter 5 of the GEIS contains a detailed discussion of the possible environmental effects of postulated accidents within the design basis of the plant. Based on that information, the Commission concluded that the design basis accidents are a Category 1 issue. The staff has not identified any significant new information related to design basis accidents in the ER, the scoping process, its independent review, or in the comments on the draft SEIS that would call into question the conclusions contained in the GEIS. Thus, the staff concludes that there are no impacts of design basis accidents beyond those discussed in the GEIS. This conclusion is stated in Section 5.1 of the SEIS.

Chapter 5 of the GEIS also contains an evaluation of the environmental effects of postulated accidents beyond the design basis of the plant. These events include accidents that lead to damage of the reactor core, i.e., severe accidents. The study concluded that the risk (probability

weighted consequences) from individual nuclear power plants, including Calvert Cliffs, is small and represents only a small fraction of the risk to which the public is exposed from other sources. At this time, the only aspect of severe accidents judged to warrant plant-specific consideration as part of license renewal concerns the evaluation of SAMAs. Accordingly, SAMAs are considered in Section 5.2 of the SEIS.

This comment did not result in modification of the SEIS text.

Comment:

One comment (E3) disagrees with the dose calculation methodology used by the staff. It states that "The averaging over a 50 mile radius is totally inappropriate. Wind rose analysis within a ten mile radius, with calculations of the spectrum of impacts of the intra-radial high density, clearly identifiable communities need to be done."

Response:

The doses used in the SAMA analysis were calculated using the NRC-developed MELCOR Accident Consequence Code System (MACCS) and site-specific data for meteorology and population. The meteorological conditions were established by sampling from a full year of site-specific weather data, defined in terms of windspeed, wind direction, atmospheric stability, and rain conditions at various distance from the plant. This accounts for the frequency of wind in each direction. The population around the site was distributed by location in a grid consisting of sixteen sectors, with each sector divided into 14 radial intervals extending out to 50 miles. This accounts for the site-specific population distribution around the site, such as areas of high population density and their respective locations. The MACCS code combines this information together with other factors to estimate the cumulative dose (rather than average dose) to the population residing within 50 miles of the plant. A distance of 50 miles was selected because existing analyses show that the large majority of health effects from a severe accident release occur within 50 miles of the plant site. In addition, this value has been widely used in the analyses of offsite consequences for other plants, and provides a convenient basis for comparison between plants.

Thus, the methodology used in the analysis appropriately takes into account the site-specific meteorological conditions and population distribution in the vicinity of CCNPP. While wind rose analysis as proposed by the commenter could be another valid approach for estimating dose consequences, the methodology used by the staff provides a reasonable estimate of the consequences of an accident for the purposes of identifying and evaluating SAMAs.

This comment did not result in modification of the SEIS text.

Comment:

Four comments (A12, A13, A50, L2) deal with the core damage probability. They assert that the probability of core damage is unacceptably high and that extending the license breaks a promise made 25 years ago by increasing the risk to the public beyond that originally agreed to.

Response:

It is important to differentiate between core damage frequency and risk. The risk associated with a severe accident corresponds to the product of the probability of the accident (i.e., core damage frequency) and the consequences of the accident. The degree of damage to the core can range over a wide spectrum, from a pin-hole leak in a fuel rod that would result in minimum consequences in terms of radiation release to a core melt progression resulting in significant radiological consequences. In addition, core damage events in which the containment building maintains its leak-tight integrity have minimal offsite consequences. Because the containment is expected to maintain its leak-tight integrity in the majority of core damage events, there is only a small likelihood (less than one chance in ten) that a core damage event would result in significant releases to the environment. Stated in other words, only a small fraction of the core damage events would result in significant releases and risk to the public.

The staff assessed the risk posed from core damage events in Chapter 5 of the GEIS. As set forth in the GEIS, the risk (probability weighted consequences) from individual nuclear power plants, including Calvert Cliffs, is small and represents only a small fraction of the risk to which the public is exposed from other sources. The only aspect of severe accidents judged to warrant plant-specific consideration as part of license renewal concerns the evaluation of SAMAs. The potential to further reduce risk at Calvert Cliffs was assessed as part of the NRC's assessment of SAMAs reported in Section 5.2 of the SEIS. As a result of this assessment, several plant enhancements were identified which would further reduce risk. These enhancements are being further evaluated by the licensee and NRC as discussed in response to the six comments below.

With regard to the comment that extending the license breaks a promise made 25 years ago by increasing the risk to the public beyond that originally agreed to, it should be noted that the regulations in place at the time of the original licensing of Calvert Cliffs (10 CFR 50.51) state that operating licenses will be issued for a fixed period of time, not to exceed 40 years from date of issuance. However, the Atomic Energy Act and 10 CFR 50.51 also state that licenses may be renewed by the Commission upon the expiration of the period. The assertion that the expiration date in the original license constitutes a promise that the plant will not operate beyond that time is inconsistent with the Atomic Energy Act. Thus, from a regulatory perspective there was never any "written promise" or agreement that the plant would not be permitted to operate beyond the original 40-year term.

These comments did not result in modification of the SEIS text.

Comment:

There were six comments related to the timing of improvements identified in the SAMA analysis (A27, A28, A41, A42, A43, A51). The comments expressed concern that SAMAs not related to managing the effects of aging are not to be implemented as part of license renewal.

Response:

The SAMA evaluation identified several plant enhancements that appear to be cost beneficial. These enhancements do not relate to managing the effects of aging during the period of extended operation and, therefore, 10 CFR Part 54 does not require them to be implemented as part of license renewal. Moreover, 10 CFR 54.30 provides that the licensee's obligation to take measures to ensure that licensed activities during the current license term will be conducted in accordance with the current licensing basis is not within the scope of the license renewal review. Therefore, it is more appropriate to pursue these enhancements as an issue under the current operating license, rather than as a license renewal issue. Contrary to the understanding reflected in two of these comments, consideration of enhancements resulting from the SAMA analysis as license renewal issues would allow implementation to be deferred until the end of the current operating term. Consideration of these enhancements as current operating issues would allow for implementation before the current license expiration date, should it be determined appropriate to implement them. The SAMAs are being further evaluated by NRC as part of a staff follow-up effort related to the Individual Plant Examination studies requested by Generic Letter 88-20.

These comments did not result in modification of the SEIS text.

A.1.11 Operational Safety Issues Associated with Current Operation

The record includes five comments related to operational safety issues (A22, A53, B5, C, F). The issues in the comments include the NRC's policy related to distribution of potassium iodide (A22, B5), the Y2K computer problem (A53), the risk associated with aircraft collision with the reactors (C, F), and a request for detailed analysis of the risk of catastrophic vessel failure due to the injection of emergency cooling water (L8). These comments involve concerns that are relevant to current CCNPP operation. In accordance with 10 CFR 54.30, these issues are outside the scope of license renewal. They have been referred to the NRC operating plant project manager for disposition. These comments did not result in modification of the SEIS text.

A.1.12 Age-related Safety Issues

The record includes ten comments associated with age-related safety issues (A3, A4, A23, A52, B6, L6, L7, L8, L9, L10). Nine of the issues deal with metallurgy. Six of the nine issues (A3, A23, A52, B6, L7, L8) deal specifically with embrittlement, and the other two (A4, L9) deal with metal samples and the reactor vessel surveillance program. One comment (L10) concerns age-related degradation of the reactor control system. The remaining comment (L6) requests that the license extension be more restrictive, especially regarding age-related materials and maintenance. These comments are outside of the scope of the staff's review of the environmental effects of renewing the CCNPP licenses. However, they involve concerns that are relevant to the extended operation of the facility and have been referred to the NRC license renewal safety project manager for disposition. These comments did not result in modification of the SEIS text.

A.1.13 Spent Nuclear Fuel

The record includes five comments related to spent nuclear fuel (A19, A45, A46, B2, E2). One of the comments (A46) deals with national high-level waste policy, and the remaining four comments (A19, A45, B2, E2) deal with high-level waste storage and disposal. The comments are addressed below.

Comment:

Comment A46 addresses high-level waste policy. It characterizes the nuclear waste policy as "...bankrupt for 50 years in terms of shuttling the waste around within the fuel pools, exceeding design capacities now four or five times in some sites, shuttling it off into dry casks that have 20-year license periods for wastes that will persist for millions of years in geological spans of time, simply to continue operation,..."

Response:

The Commission's regulations in 10 CFR 51.23(a) (the Waste Confidence Rule) sets forth the Commission's position on its high level waste policy. 10 CFR 51.23(a) states

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.

This comment did not result in modification of the SEIS text. See Section A.1.3 of this report for further discussion of the Waste Confidence Rule.

Comment:

The record contains four comments (A19, A45, B2, E2) that deal with high-level waste storage and disposal.

Response:

Onsite storage of spent nuclear fuel is a Category 1 issue. The safety and environmental effects of long-term storage of spent fuel onsite has been evaluated by the NRC, and, as set forth in the Waste Confidence Rule, the NRC generically determined that such storage can be accomplished without significant environmental impact. In the Waste Confidence Rule, the Commission determined that spent fuel can be stored onsite for at least 30 years beyond the licensed operating life, which may include the term of a renewed license. The NRC has a certification process for casks, regulated by 10 CFR Part 72.

Siting of a waste repository is a separate regulatory action involving the U.S. Department of Energy (DOE). Characterization of the site under review is projected to be complete by 2002, and a geologic repository is not expected to be ready before 2010 (GEIS). In the interim, onsite spent fuel storage in pools and in dry cask storage facilities continues in accordance with NRC regulations. Consequently, these comments did not result in modification of the SEIS text.

A.1.14 Decommissioning

The record includes two comments related to decommissioning (A20, B3). These responses to these comments follow.

Comment:

The comments indicate concern about eventual decommissioning, burial costs, and future care and protection of the facility.

Response:

Decommissioning is a Category 1 issue. Specific issues related to decommissioning-waste management, socioeconomic effect, radiation doses, air quality, water quality, and ecological effects-are addressed in Chapter 7 of this SEIS. The staff did not identify any significant new information in the ER, the scoping process, its independent review, or review of the comments to the draft SEIS that would call into question the conclusions set forth in the GEIS. Therefore, the staff relies upon the conclusions as amplified by the supporting information in the GEIS. No modifications were made to the text of the SEIS on the basis of these comments.

A.1.15 Alternatives

The record contains six comments directly related to alternatives (A59, B12, E1, G, L3, Q3). Three of the comments (A59, B12, Q3) provide information about alternatives considered in the draft SEIS. The information supplied in comment Q3 discusses the effects of recent developments that affect the selection of alternatives in Maryland, including recent changes in property tax laws, deregulation, air emission offsets, and BGE conservation programs. Information from this comment has been incorporated in Chapter 8 of this report.

Three of the comments (E1, G, L3) object to the various aspects of the discussion of alternatives in Chapter 8. These comments are addressed below.

Comment:

One comment (L3) objects to the conclusion related to demand-side management as part of the conservation alternative in Section 8.2.4.11. The comment asserts that conservation technology is a viable replacement alternative to CCNPP. It also asserts that utility deregulation could result in cheaper alternatives to the facility.

Response:

The text of Section 8.2.4.11 has been revised to include new information regarding utility deregulation. However, as stated in the revised text of Section 8.2.4.11, it is not clear that utility deregulation will result in an increase in cost-effective conservation; moreover, utility-sponsored conservation is declining.

Comment:

Two comments (E1, G) suggest that the SEIS should consider fuel cells as an alternative.

Response:

Section 8.2.4.12, which discusses fuel cells, has been added to the SEIS.

A.1.16 Miscellaneous

The record contains five comments that do not fall within any of the other categories (M, N, P, R, T). One of the comments (R), submitted by BGE, supports the staff approach and conclusions, and contains a list of 170 specific comments. Most of the specific comments are technical clarifications, corrections to information in the SEIS, or suggested changes in format and presentation of the SEIS. Responses to the specific comments are provided in Table A.2. These comments are the subjects of Sections A.1.17 and A.1.18, respectively.

Three of the comment letters (M, P, T) appear to have been placed on the CCNPP docket in error. Comment letter M was submitted by BGE as a comment on a rulemaking. The letter was forwarded to the correct docket. Comment letter P, which supports the GEIS conclusions on the effects of transportation of high-level waste, may also have been intended as a comment on the rulemaking. Similarly, comment letter T (submitted after the close of the comment period for the draft SEIS) also appears to have been submitted in response to the rulemaking and was forwarded to the correct docket.

Finally, one comment (N) provided two Internet URLs (Universal Resource Locator [address]) for a commercial concern providing services related to nuclear waste storage. The NRC does not recommend or otherwise endorse the offerings of the concern.

A.1.17 Technical Clarifications and Corrections

The list of 170 specific comments included with comment R are technical enhancements or correction of information such as plant dimensions, document dates, and plant-specific terminology. Of the specific comments provided, those in the following list fit this category:

R2, R4, R12, R15, R16, R20, R22, R26, R28, R29, R30, R31, R32, R35, R36, R47, R51, R57, R61, R64, R65, R84, R89, R92, R95, R100, R107, R108, R109, R110, R111, R115, R116, R119, R130,

R132, R133, R135, R136, R137, R138, R139, R140, R141, R142, R143, R144, R152, R153, R155, R159, R166, R168, R170.

A separate log of BGE's specific comments and the NRC responses is attached as Table A.2.

A.1.18 Format and Presentation (spelling, grammar, references, clarity, etc.)

Many of the specific comments included with comment R suggested changes for clarification or accuracy and correction of typographical errors. The following comments fit this category and the referenced text was corrected, clarified, or resolved.

R1, R3, R5, R6, R7, R8, R9, R10, R11, R13, R14, R17, R18, R19, R21, R23, R24, R25, R27, R33, R34, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R48, R49, R50, R52, R53, R54, R55, R56, R58, R59, R60, R62, R63, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R80, R81, R82, R83, R85, R86, R87, R88, R90, R91, R93, R94, R96, R97, R98, R99, R101, R102, R103, R104, R105, R106, R112, R114, R117, R118, R120, R121, R122, R123, R124, R125, R126, R127, R128, R129, R134, R147, R149, R150, R151, R154, R156, R157, R158, R160, R161, R162, R163, R164, R165, R167, R169.

The specific comments and NRC responses are included in Table A.2.

Comments D and Q4 also included specific comments of this nature. In each case, the text of the SEIS has been modified in response to the comment.

Table A-2 BGE's Comments and Staff Response

No.	Page	Line Nos.	Comment	Disposition
1.	1-4	21	The federal register citation for the notice of acceptance for docketing is 63 FR <u>27601</u> , not 26701.	Reference corrected
2.	1-7	7	The surface water appropriation permit number and expiration date need to be corrected. The permit, CA71S001 (Q2), expires on April 1, 2001.	Expiration date corrected
3.	1-7	9, 10 and 15-17	Table 1-1 identifies consultation request dates for Fish and Wildlife Service (FWS), National Marine Fisheries Service, and Maryland Historic Trust, but does not identify the agencies' response dates. Should the responses from these agencies be provided in Table 1-1?	Responses discussed later in document. FWS reply dated 3 November 1998
4.	2-1	28	The three crops do not all agree with the three given on page 2-22, line 11. Those on page 2-22 are correct (corn, wheat, and hay). Tobacco is not included in the list of crops grown on the Calvert Cliffs Nuclear Power Plant (CCNPP) site, and should be replaced with wheat on this list.	Agricultural products corrected
5.	2-1	34-37	The sentence beginning, "Part of the upper areas . . ." is confusing, as it could be interpreted that St. Leonard Creek drains directly into the Chesapeake independently of the Patuxent River. [suggested rewording] "Part of the upper areas, used primarily during the construction period, drain through the Johns Creek watershed into the St. Leonard Creek, which then drains into the Patuxent River approximately 7 km (4 mi.) from the plant. The Patuxent River drains into the Chesapeake Bay approximately 16 km (10 mi.) south of the plant."	Clarified as suggested
6.	2-1	40	Using the term 'region' when referring to the Chesapeake is ambiguous and should be deleted from the sentence beginning on line 40. This sentence should be reworded, as follows: "The Bay has an average depth of approximately 9m (30 feet) . . ."	Clarified as suggested
7.	2-1	43	The source of the referenced information is K. G. Sellner & B. A. Peters [in Heck 1987]. Most style guides would not recommend referencing only the cover document. [Also, the original reference notes that the springtime condition described is found in the upper 20-30 km of the Bay . . .which is NOT in the vicinity of CCNPP.]	Clarified as suggested
8.	2-4	7	The discharge structure is located offshore, beneath approximately 10 feet of water, and should not be discussed under the heading of External Appearance. Also, "service building intake structure" is not CCNPP terminology; this building is referred to as the Intake Structure. This sentence should be corrected, as follows: "The <u>Intake Structure</u> is located east (bayside) . . ."	Clarified sentence as suggested. Discussion of discharge structure appears in 2.1.3, Cooling and Auxiliary Water Systems.
9.	2-5	Fig 2-3	The legend of the map should include 69-kV Southern Maryland Electric Cooperative (SMECO) transmission line, as this figure is called out (on page 2-16, line 46) in reference to this plant feature.	Clarified as suggested
10.	2-10	4	There is no (BGE 1998a) in the reference list in Section 2.3.	Reference corrected

Table A-2 (Contd.)

Appendix A

No.	Page	Line Nos.	Comment	Disposition
11.	2-10	22, 23	The sentence beginning "Each of the two reactors . . ." does not belong here. It is misleading in that the remainder of the paragraph discusses the circulating water system rather than the primary system. For clarity, this sentence should be relocated to line 36, after the sentence beginning, "The primary coolant loop . . .", and reworded as follows, "The primary coolant system for each unit consists of a reactor, two steam generators, two reactor coolant loops, and four reactor coolant pumps."	Clarified as suggested
12.	2-10	27-29	A consistent source should be used for the dimensions of the intake and discharge channels. Calvert Cliffs' Updated Final Safety Analysis Report (UFSAR), Figure 1-3B, shows these dimensions to be approximately 4500 ft. and 850 ft, respectively. The intake channel length is taken from the baffle wall to the farthest point in the dredged channel, and the discharge channel length is taken from the shoreline to the end of the discharge conduit. (See comment for page 4-12, lines 9 and 15 and Figure 2-7.)	Dimensions changed per reference
13.	2-10	30	The draft Supplemental Environmental Impact Statement (SEIS) refers to an "intake canal" in several places. This is incorrect terminology. Calvert Cliffs Nuclear Power Plant draws cooling water directly from the Bay through a dredged channel, not a canal as is common for other plants.	Clarified as suggested
14.	2-11	Fig. 2-7	The dimension of the intake channel should be shown to be "Approximately 4,500 ft." per UFSAR Figure 1-3B. (See comment for page 2-10, lines 27-29 and page 4-12, lines 9 and 15.)	Graphic dimension corrected
15.	2-12	4	For clarity, this sentence should be revised to add the word "groundwater," as follows: "CCNPP has five <u>groundwater</u> production wells"	Clarified as suggested
16.	2-12	5	The draft SEIS indicates that nine wells supply water for domestic use in outlying areas. One of the nine wells was abandoned and was excluded from Environmental Report (ER) Table 2-3 and Figure 2-7. This change should also have been made in the second paragraph of ER Section 2.1.4, which may have been the basis for the statement in the draft SEIS.	Changed to eight wells.
17.	2-12	9-10	For clarity, this sentence should be revised, as follows: "Groundwater wells provide the source water for domestic, plant service and demineralizer make-up water needs,"	Clarified as suggested
18.	2-12	11	For clarity, this sentence should be revised, as follows: ". . . discharged through the <u>submerged outfall</u> to the Chesapeake Bay."	Clarified as suggested
19.	2-12	Section 2.1.4	A source reference should be provided for the description of CCNPP's radioactive waste processing systems.	Add reference

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Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
20.	2-13	32	The draft SEIS indicates that the concentration limits of liquid effluents meet the specifications of 10 CFR Part 20, Appendix B, Table 2. This Table reference is to the current version of Part 20, whereas CCNPP's effluent control program, as discussed in the Offsite Dose Control Program (ODCM), is to the older version of Part 20. Therefore, the correct reference for CCNPP would be 10 CFR Part 20, Appendix B, Table II. (NOTE: Use of the maximum permissible concentration values in the old Table II still ensures that the current effluent concentration limits in Table 2 are met.)	Clarified as suggested
21.	2-13	9	It is unclear which system is considered the "Liquid Radwaste Treatment System", as this is not BGE terminology. The Reactor Coolant Waste Processing System (RCWPS) and Miscellaneous Waste Processing System are collectively considered liquid waste processing systems.	Clarified as suggested
22.	2-13	18	The RCWPS has four Reactor Coolant Waste ion exchangers.	Corrected
23.	2-13	22-24	Taken individually, the first three sentences of the fifth paragraph of Section 2.1.4.1 are technically accurate; however, the order of these sentences does not follow the process pathway of the RCWPS. Reactor Coolant Waste liquid is filtered and passed through the ion exchangers prior to being transferred to the Reactor Coolant Waste receiver tanks.	Revised sentence order
24.	2-13	46	[editorial comment] It appears that a word is missing from the sentence describing normal operation of the Waste Gas Processing System (WGPS). The sentence should be revised, as follows: "... designed to store the gases <u>removed</u> from liquid waste ..."	Clarified as suggested
25.	2-14	15	[editorial comment] "turbine building ventilation." should be a separate bullet.	Typographical correction
26.	2-14	17	To clarify the statement regarding the control of gaseous releases, the sentence on line 17 should be replaced with the following: "Potential release pathways are sampled according to approved plant procedures. Occasional releases from abnormal pathways are quantified and recorded. BGE maintains all gaseous releases within ODCM limits." This text is taken from the CCNPP UFSAR, Revision 25.	Incorporated information provided
27.	2-14	19 and 35	The name "Gaseous Radwaste Treatment System (GRTS)" is not BGE terminology. The terminology used earlier in the draft SEIS should be used here as well (WGPS).	Terminology changed for consistency
28.	2-14	27-29	The dose rates provided in lines 27 through 29 are annual limits, and should be provided in terms of mSv/year (mrem/year). They should be clearly identified as annual dose limits.	Revised as suggested
29.	2-14	28	The skin dose rate limits should be 30 mSv/year (3000 mrem/year).	Revised as suggested

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
30.	2-14	35	Although CCNPP design incorporates filters and waste gas processing equipment that collectively may be referred to as ventilation exhaust treatment equipment, the plant design does not include a "Ventilation Exhaust Treatment System," per se. Therefore, the draft SEIS should be revised, as follows: "The WGPS is used to reduce radioactive material in gaseous waste . . ."	Site-specific information incorporated
31.	2-15	3	For accuracy, the first sentence of Section 2.1.4.3, Solid Waste Processing, should indicate that BGE packages solid waste according to the applicable requirements of 49 CFR Parts 171 through 177. Disposal and transportation are performed in accordance with the applicable requirements of 10 CFR Parts 61 and 71, respectively.	Clarification of regulations incorporated
32.	2-15	9-10	The draft SEIS states that RCWPS evaporator bottoms are normally recycled or may be solidified after use. Baltimore Gas and Electric Company's Process Control Program does not include provisions for waste solidification. This sentence should be revised as follows: "RCWPS evaporator bottoms are normally recycled otherwise processed in accordance with BGE's Process Control Program."	Site-specific terminology incorporated
33.	2-15	15	The draft SEIS states that dry active waste is temporarily stored in the Materials Processing Facility until it can be shipped to a permanent disposal facility. This sentence should be revised to indicate that dry active waste may alternatively be shipped to a processing facility.	Clarified as suggested
34.	2-15	24	Although much of Lake Davies is an undeveloped field, the interim resin storage facility is located on a crushed gravel pad. Therefore, this sentence would be more accurate if the word "meadow" were deleted.	Clarified as suggested
35.	2-15	25,25	The draft SEIS discusses the two areas used for resin storage at CCNPP; the interim resin storage facility and the West Road Cage. The SEIS notes that the interim resin storage facility was <u>designed</u> for up to five years of storage, and the West Road Cage provides interim storage for up to five years. By SECY-94-198, the NRC noted that there was no health and safety basis for the five-year criterion, and eliminated this criterion from GL 81-38. Therefore, the statements indicating that these areas provide interim storage for up to five years should be removed from the draft SEIS.	Changed to reflect NRC's elimination of criterion
36.	2-15	33	Offsite processing facilities are also used for decontamination of equipment. The bullet on line 33 should say, "offsite processing facility for segregation, recycling, compaction, <u>decontamination</u> , and incineration."	Addition to reflect site practices
37.	2-16	7, 8	For completeness, this sentence should be reworded, "Long-term outages are scheduled for refueling and for maintenance, modification and/or replacement of major components."	Clarified as suggested

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Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
38.	2-16	18	There is no (NRC 1996) in the reference list in Section 2.3.	Reference clarified, last four references restored to list
39.	2-17	22	Reference (Calvert County 1997) should be (Calvert County 1997a). (See comment for page 2-48, lines 25, 27.)	The reference is correct
40.	2-17	37	The methodology for citing the reference from the Chief - Coastal Zone Consistency, Maryland Department of the Environment (MDE) is not consistent with that for other references from MDE. For consistency, this reference should be called out on page 2-17, line 37 as (MDE 1998), not (Ghigliarelli 1998), and the reference source on page 2-49 should be revised accordingly.	Clarified as suggested
41.	2-18	1	Reference (Calvert County 1994) needs to be either 'a' or 'b' per Sec. 2.3.	Reference should be 1994a
42.	2-18	21	The text indicates that the average daily groundwater withdrawal rates over the last two years was 1.89×10^{-2} m ³ /s (392,000 gpd). A reference should be provided for this value (possibly BGE's November 20, 1998 Request for Additional Information [RAI] response submittal), as well as defining the two-year period (possibly July 1996 - June 1998). (See comments for page 4-27, line 3 and page 8-7, line 9.)	Revised as suggested.
43.	2-19	15	The sentence beginning, "According to EPA . . ." needs a reference citation.	Add reference to URL as footnote
44.	2-20	21	The draft SEIS indicates that the site includes approximately 80 ha (200 acres) of marshlands. A reference should be indicated for the source of this information and the location of the marshlands.	Statement comes from FES.
45.	2-20	21-23	It is suggested that this paragraph be moved to follow the paragraph beginning, "Two Federally protected species . . .", so that the first three paragraphs will address saltwater resources, and the last two paragraphs will address fresh water species.	Editorial suggestion incorporated
46.	2-20	25	[sp.] Atlantic loggerhead turtle . . .	Spelling corrected
47.	2-20	27-28	The text indicates that BGE has " . . . occasionally collected the shortnose sturgeon." Based on analysis of the monthly trawl samples of fishes taken in the vicinity of CCNPP between 1969 and 1981, it is apparent that only one shortnose sturgeon fish was captured during that period, in May 1979 (Reference: Heck, K.L., Jr., [Ed.] 1987. <i>Ecological Studies in the Middle Reach of Chesapeake Bay. Lecture Notes on Coastal and Estuarine Studies</i> . Springer-Verlag-Berlin, Heidelberg, New York.)	Clarified as suggested
48.	2-20	41-42	The term 'associations' would be more appropriate than 'biomes' in this context.	Clarified as suggested
49.	2-20	43	There are various species of <i>Quercus</i> in this association. The specific species " <i>rubra</i> and <i>alba</i> " should be replaced with "spp" to indicate the multitude of species present.	Clarified as suggested

Table A-2 (Contd.)

Appendix A

No.	Page	Line Nos.	Comment	Disposition
50.	2-21	Tables 2-3 and 2-4	Provide reference source for material in Tables 2-3 and 2-4. If possible, provide additional information as to what parts of the Chesapeake Bay these species are located.	References added
51.	2-22	4	Replace <i>Azalea</i> with <i>Rhododendron</i> .	Corrected
52.	2-22	6	Since there were two plans created for two separate parcels of land, the sentence should begin, "In 1985 and 1987, BGE foresters . . ."	Corrected
53.	2-22	7	The correct agency is the Maryland Department of Natural Resources.	Corrected
54.	2-22	38	The second sentence on line 38 should be reworded, as follows: "These species are also protected under State . . ."	Clarified as suggested
55.	2-23	Table 2-5	Provide reference source for material in Table 2-5. It is apparently derived from (BGE 1998). Also, on line 4, <i>Cicindella</i> is spelled incorrectly. The correct spelling is <i>Cicindela</i> , as per line 6.	Spelling corrected
56.	2-24	1	Every bold heading has a Section number (e.g., 2.2.7.1), unless it is also italicized.	Deleted heading
57.	2-24	40	As per Table 2-6, 909 CCNPP employees live in Calvert County. Table 2-6 is in agreement with data provided by BGE in the November 20, 1998 submittal.	Number corrected
58.	2-24	42	Change reference to (US Department of Commerce [DOC] 1992a).	Changed as suggested
59.	2-25	12	[spelling correction] Harford.	Spelling corrected
60.	2-25	Table 2-6	The source document for Table 2-6 should be included in Section 2.3, References.	Added to reference list
61.	2-25	28	The 1998 figures are not in Table 2-7 as the text states. If the 1998 figures are projections or estimates, the text should say so.	Added 1998 #s to table; sources provided
62.	2-26	Table 2-7	Provide reference source for material in Table 2-7.	Add reference to list
63.	2-27	Table 2-8	Provide reference source for material in Table 2-8.	Added reference
64.	2-30	26	The draft SEIS indicates that the highway is considered to meet Service Level C. Provide the source of this information, and clarify whether this rating applies to the portion of Route 2-4 near the plant.	Changed to Level D after reviewing Calvert County 1997 Comprehensive Plan
65.	2-31	7	Figures 2-2 and 2-3 show the CCNPP location, but do not show "general land use and planned land uses" as the text states.	Deleted reference to Fig 2.3, replacing Fig. 2.2
66.	2-31	17 and 29	There is no reference (Calvert County 1997b), although there is a (Calvert County Planning Commission 1997b). (See comment for page 2-48, lines 25, 27.)	Changed Calvert County Planning Co. reference to Calvert County 1997b
67.	2-31	42	This data should be supported by a reference citation.	Added citation – Calvert County 1997b
68.	2-32	25 and 35	There is no reference (Calvert County 1997b), although there is a (Calvert County Planning Commission 1997b). (See comment for page 2-48, lines 25, 27.)	Reference corrected see above

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Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
69.	2-33	8	Second sentence should begin, "The Forest Conservation Act, . . ."	Regulation title corrected
70.	2-33	46	The text indicates that the ER estimated resident population. For accuracy, this sentence should be revised, as follows: "Sections 3.8.1 and 3.8.2 of the applicant's ER presented US census data for 1990 and estimated resident population for each decade . . ."	Clarified as suggested
71.	2-34	6	Reference (Virginia Employment Commission 1993) is not listed in Section 2.3.	Add reference to list
72.	2-39	45	Reference (Washington, DC Mayor's Office of Planning 1995) is not listed in Section 2.3.	Add reference to list
73.	2-43	20	Reference (DOC 1996) is not listed in Section 2.3. Should it be DOC 1995?	DOC 1996 reference added to list
74.	2-45	29-30	When a document is authored by more than two co-authors, they are typically not cited individually. Following this convention the report by Hopkins, Collier, and Fischler should be cited as (Hopkins <i>et al</i> 1992).	Editorial correction incorporated
75.	2-47	References	Multiple citations from the same source should be listed in chronological order (e.g., Five BGE citations from 1970-1998 are randomly listed.)	Corrected reference order
76.	2-48	25, 27	The list of references identifies different sources for the Calvert County Zoning Ordinance and the 1997 Comprehensive Plan, but the dates include an alphabetic suffix, indicating that they were prepared by the same party. Both documents were adopted by the Calvert County Commissioners, so it may be more appropriate to identify them as 'Calvert County 1997a' and 'Calvert County 1997b.'	Changed to Calvert County 1997a and 1997b
77.	2-49	17	(See comment for p. 2-17, line 37.)	Revised as suggested
78.	2-49	24	K.L. Heck, Jr. is the editor of the referenced document. The citation should be indicated in the reference list [i.e., Heck, K.L., Jr., (Ed.)].	Revised as suggested
79.	3-2	23-27	Section 3.0 of the draft SEIS evaluates the potential environmental effects of refurbishment actions. In the afternoon session of the public meeting held on April 6, 1999, some confusion arose as a result of a statement made by BGE that there was no refurbishment to be conducted that affected anything outside the perimeter of the Protected Area. To clarify this statement, BGE hereby reaffirms the statement originally made on page 2-6 of the License Renewal Application - Environmental Report, and subsequently reiterated in the draft SEIS, that BGE "has not identified the need to undertake the major refurbishment activities that the GEIS [Generic Environmental Impact Statement] assumed for license renewal, and no other modifications have been identified that would directly affect the environment or plant effluents."	No response required.
80.	4-7	18	Incorrect document reference. Should be (MDE 1998b).	Reference corrected
81.	4-8	41	Incorrect document reference. Should be (MDE 1998b).	Reference corrected

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
82.	4-8	45	Hirshfield & Hixson (1981) is the impingement portion of Academy of National Science-Philadelphia (ANSP) (1981). Therefore, the text essentially cites the same Clean Water Act (CWA) Section 316[b] study two different ways.	Changed reference from Hirshfield & Hixon to ANSP, 1981 for consistency.
83.	4-9	7	Change Hirshfield & Hixson (1981) to ANSP (1981).	Reference made more consistent
84.	4-9	7	The 316[b] demonstration was an analysis of three years of sampling. The sampling method used during the formal 316[b] demonstration was not unique to that study. It would be more appropriate to say that this method was employed for the formal 316[b] demonstration and was applied for a total of 21 years of continuous impingement monitoring.	Changed as requested.
85.	4-9	8-11	The sampling method description is misleading. For clarity, the following changes should be made: "The sampling schedule was based on <u>repeating</u> six-day cycles in order to sample each hour of the day with equal frequency over a 365-day period. On each sampling day, one-hour collections were made <u>at each unit</u> . Since data from an earlier impingement <u>survival</u> study at the CCNPP"	Clarifications incorporated
86.	4-9	12	The draft SEIS indicates that survival data from (Burton 1976) was used to assess potential survival of impinged species. However, the survival data applied were taken from three studies subsequent to Burton 1976. See ANSP 1981, p. V-4.	Clarifications incorporated
87.	4-9	17, 22, and 27	Replace 'impinged' with 'collected'.	Terminology corrected
88.	4-9	18, 23, and 28	[Add] "Yearly <u>impingement</u> estimates were . . ." The first line is a total number of finfish and blue crabs caught during each year throughout the collection periods. The second line is the annual impingement estimate based on the operating time of the plant.	Terminology clarified
89.	4-9	29	The correct number is 261,785.	Number corrected
90.	4-9	32	For clarity and accuracy, this paragraph should be reworded, as follows: "Thus, for the 1977 through 1979 time frame, <u>an annual average of 1,600,000</u> finfish and blue crabs <u>were</u> collected on the traveling screens, <u>of which 260,000 did not survive</u> . The expected monetary loss due to the death of finfish and blue crabs due to impingement <u>was \$24,000 per year</u> ."	Corrected printing error and clarified statement

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Appendix A

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
91.	4-9	36-39	It should be clarified that the ANSP (1981) study used the annual studies from 1977-79. The Horwitz (1987, in Heck, [Ed.]) summary report used the annual studies from 1975-83, including the same 1977-79 reports. The methods need not be described as though they were separate investigations, since they were all ANSP studies. Additionally, they were not 'concluded in 1983'. They continued for 12 more years. It would be better if the method were described once . . . then note that three of the annual summaries were used to satisfy the formal CWA Section 316[b] requirement and the first nine years of studies were compiled and summarized in Heck [really Horwitz] (1987). The protocol was complicated and did change in the early years but settled on a method that was designed to sample each generating unit separately during all times of the day and all tidal conditions.	Clarifications to reflect actual sampling period
92.	4-9	38	Randomly selected days were used only in 1975. The format became more structured after that, and continued for 21 years. While the ANSP and Heck studies are valuable as summary documents, it should be noted earlier in Section 4.1.2 that full, annual impingement investigations were conducted during the first 21 years of plant operation.	Changes made to reflect sampling period
93.	4-9	43-45	The sentence that begins, "The number of potential episodes . . ." needs clarification. It is confusing and does not fit with the rest of the paragraph. If it can not be re-stated, it should be omitted. If this sentence is retained or reworded, the word "discreet" should be replaced with "discrete."	Clarified the sentence
94.	4-10	24	[editorial correction] The sentence beginning on line 24 should read, "Experiments <u>showed</u> impingement survival of blue crabs . . ."	Editorial suggestion incorporated
95.	4-10	30	To capture the breadth of the information in (BGE 1998b), it is suggested that the sentence beginning 'Three summary studies . . .' be reworded, as follows: " <u>In addition to 21 annual impingement surveys, three summary studies are discussed:</u> . . ."	Changed to reflect the many years of surveys
96.	4-10	32	The third summary reference should be corrected, as follows: " . . . (Heck 1987) and a 1989 Trends report developed by ANSP."	Changed as indicated
97.	4-11	16	This bullet indicates that certain environmental conditions (warm weather, thermally stratified Bay, and prolonged west or southwest winds) <u>may not</u> be attributable to CCNPP operations. It would be more accurate to say that these conditions <u>are not</u> attributable to plant operations.	Changed to reflect lack of correlation between occasional stressful conditions and plant operations

Table A-2 (Contd.)

	Page	Line Nos.	Comment	Disposition
98.	4-11	31-33	The demonstration of thermal discharge effects is ascertained by CWA Section 316(a), not 316(b), as stated. Additionally, the 316(a) variance is based on thermal discharges, not cooling water intake structure design. The 316(b) discussion belongs in Section 4.1.2, Impingement.	Corrected as indicated
99.	4-12	3	In other parts of the document, the law is called the CWA. For consistency, it is suggested that the same terminology be used here as well.	Regulation title changed for consistency
100.	4-12	9 and 15	A consistent source should be used for the dimensions of the intake and discharge channels. Calvert Cliffs' Updated Final Safety Analysis Report, Figure 1-3B, shows these dimensions to be approximately 4500 ft. and 850 ft, respectively. The intake channel length is taken from the baffle wall to the farthest point in the dredged channel, and the discharge channel length is taken from the shoreline to the end of the discharge conduit. (See comment for page 2-10, lines 27-29 and Figure 2-7.)	Dimensions made consistent
101.	4-12	9	CCNPP does not have an intake canal. (See comment for page 2-10, line 30.) In this case, the word "canal" should be replaced with either "channel" or "forebay."	Clarified as suggested
102.	4-12	12	As discussed in the CCNPP Updated Final Safety Analysis Report, the condenser tubes for Unit 1 are austenitic stainless steel and those for Unit 2 are titanium. For clarity, the following wording is suggested, "The condenser shells contain austenitic stainless steel (Unit 1) and titanium (Unit 2) tubes."	Clarified as suggested
103.	4-12	41	[typographical error] should say (0.4 mi ²).	Typographical error corrected
104.	4-18	33	For consistency with the GEIS definition, it is suggested that the discussion of sparseness be reworded, as follows, "Sparseness measures population density <u>and city size</u> within 32 km . . ."	Clarified as suggested
105.	4-19	20	" . . . BGE's estimate of 60 license renewal employees . . ." should be revised to " . . . BGE's bounding estimate of 60 license renewal employees . . ." Additionally, it should be clarified that BGE does not expect to hire any additional employees for license renewal, but used the NRC's bounding estimate of 60 as the basis for analyzing a bounding case scenario. This document should be very clear regarding the expectations for the license renewal period.	Revised for clarification, numbers updated
106.	4-20	15, 24	The text should be revised to indicate that the 60 additional license renewal employees is a bounding estimate.	Clarified as suggested

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Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
107.	4-20	24	The draft SEIS indicates that 60 additional plant employees could generate a population increase of up to 577 people in Calvert and St. Mary's counties. Please explain how this number was calculated. Calculations performed by BGE indicate that the estimated population increase in these two counties would be 643 people, as follows: Percentage of employees in Calvert and St. Mary's counties per draft SEIS Table 2-6 $([909 + 256]/1309)$ 89% Maryland employment multiplier 3.9997 Average household size in Maryland 3.01 Based on this data, the estimated population increase in Calvert and St. Mary's counties was calculated, as follows: $(60 \text{ employees} \times 89\% \times 3.9997 \times 3.01 = 642.9 \text{ [643 people]})$.	Revisions made based on recalculation of population increase
108.	4-20	30, 31	Revise "... population increase of about 50 people ..." and "... (9 percent of 577)" to "... population increase of about <u>58</u> people ..." and "(9 percent of <u>643</u>)", respectively, per the revised population projection discussed in the comment for page 4-20, line 24.	Numbers corrected based on revised projections
109.	4-20	36	Revise "... between 9500 to 15,000 additional liters per day (L/d) (2500 to 4000 gpd) ..." to "... between <u>11,600</u> to <u>17,400</u> additional liters per day (L/d) (<u>2900</u> to <u>4640</u> gpd) ..." per the revised population projection discussed in the comment for page 4-20, line 24.	Numbers corrected based on revised projections
110.	4-20	39	Revise "An additional 50 residents, drawing an additional 15,000 L/d (4000 gpd) ..." to "An additional <u>58</u> residents, drawing an additional <u>17,400</u> L/d (<u>4640</u> gpd) ..." per the revised population projection discussed in the comment for page 4-20, line 24. The recalculated water usage is still less than 1 percent of the current daily output of the Solomons and Lexington Park water supply systems, so the impact on the water supply would still be SMALL.	Numbers corrected based on revised projections
111.	4-21	16	The plant-related population increase for Calvert County should be revised from 433 to 502, based on the revised employment data in Table 2-6 $([909/1309] \times 60 \times 3.9997 \times 3.01 = 501.6 \text{ [502 residents]})$.	Numbers corrected based on revised projections
112.	4-21	32	Revise to reflect annual payment, as follows: "... reaching approximately \$33 million <u>per year</u> by 2036."	Clarified as suggested

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
113.	4-23	36-41	Section 4.4.5 of the draft SEIS, beginning on line 36, states the following: "Because there is a distinct possibility that undiscovered and/or unrecorded prehistoric and historic period archaeological sites exist in the 2300-acre plant site, as well as currently undocumented historic structures, additional care must be taken during normal operation or maintenance to ensure that cultural resources are not inadvertently impacted. These activities may include not only operation of the plant itself but also land management-related actions such as farming, recreation, wildlife habitat enhancement, or maintaining/upgrading access roads throughout the plant site." These statements are unsubstantiated by BGE's ER, the State Historic Preservation Officer response, or any other data or analysis in the draft SEIS and should be removed.	Comment discussed separately in Section A.1.1, Archaeology and Historical Resources
114.	4-24	9	The cited reference should be (NRC 1996g).	Reference corrected
115.	4-24	35-36	The environmental justice discussion presented in this document should be more well-defined. Define "minority" and "significant contribution."	Definition of minority provided, significant "concentration" text rewritten
116.	4-24	35-36, and Figure 4-1	The figure appears to depict a 10-mile radius, rather than an 80 km (50-mile) radius as indicated. Also, a source reference for this map should be provided. The text on page 4-24, line 44-45 identifies specific communities; therefore, these communities should be identified on the figure.	Figures 4-1 and 4-2 replaced to be consistent with text
117.	4-24	44	Same comment as page 4-24, lines 35-36; define "low income."	Defined per Comment 115 above
118.	4-24	45	[spelling error] Huntingtown	Eliminated in text revisions
119.	4-25	Figure 4-1	The title for this figure is "Census Block Groups with Large Minority or Low-Income Populations." This appears to be inconsistent with page 4-24, line 36, which indicates that no Census block group showed a significant concentration of minority individuals. (This may be resolved by defining environmental justice terms, such as "minority", "low income", and "significant contribution.") In addition, to combine the two may be misleading. Two types of shading should be presented to represent each group (minority and low-income).	Figure and caption updated
120.	4-26	7	[editorial correction] The word "issue" should not be plural. "For this issue . . ."	Typographical error corrected

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
121.	4-26	23	The conclusion for groundwater quality degradation (saltwater intrusion) says that there are no impacts of "radiation exposures to the public." The conclusion sentence needs to be corrected.	Wording corrected to be consistent with topic
122.	4-26	26	Reference should be to Section 4.5.1.	Subsection number corrected
123.	4-27	3	A reference needs to be cited for the groundwater withdrawal data. Also, this value (409,000 gpd) is not consistent with information provided in Section 2.2.2, Water Use. (See comment for page 2-18, line 21 and page 8-7, line 9)	Added reference. Numbers are consistent, averaging is different: 409,000 gpd based on both units operating; 392,000 gpd includes periodic outages over last two years.
124.	4-28	8	To more accurately reflect the FWS recommendations, the sentence describing constraints on site activities in the vicinity of bald eagle nests should be revised to indicate that this only refers to "active" nests. This sentence should be revised, as follows: "The FWS also recommended constraints on activities in the vicinity of <u>active</u> bald eagle nests . . ."	Clarified as suggested
125.	4-28	12	The sentence beginning with "Any activities resulting . . ." should be reworded to more accurately reflect the FWS recommendation. [suggested wording] "It was further recommended that BGE initiate consultation with the FWS whenever activities are planned that would result in significant habitat changes within the 0.4 km (1/4 mile) radius of active bald eagle nests, regardless of time of the year."	Additional information incorporated
126.	4-28	20	For clarity, the following wording is suggested: "Thus, <u>operating license</u> renewal should not..."	Clarified as suggested
127.	4-28	20	[editorial correction] "of either" is repeated at the end of line 20.	Typographical error corrected
128.	4-32	17	The reference citation should be corrected, as follows: "Heck, K. L., Jr. (<u>Ed.</u>) 1987 . . ."	Revised as suggested
129.	4-32	22	[editorial correction] The correct date is April 8, 1981, not 1991.	Typographical error corrected
130.	5-2	32	The draft SEIS indicates that BGE was still evaluating three "design" changes when the application was submitted. For accuracy, two of the three changes being reviewed were design changes, and one was a procedure change. It would be more accurate to indicate that "... BGE was still evaluating three <u>proposed</u> changes at the time . . ."	More appropriate terminology incorporated
131.	5-2	39-40	Delete sentence, "As a result of further evaluation . . .," and change the first word of the following sentence from "This" to "The." The changes better reflect BGE's current position on SAMA 66b.	Sentence changed to eliminate reference to BGE's conclusions

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
132.	5-2	42	The draft SEIS indicated that a watertight door is currently being installed under BGE's Corrective Actions Program. The severe accident management analysis (SAMA) to install a watertight door is being pursued under BGE's <u>modification process</u> , as per reference (BGE 1999).	Appropriate terminology incorporated
133.	5-10	3	CCNPP does not have centrifugal charging pumps. For CCNPP, the benefit to be gained from providing a back-up source for component cooling water is to "... reduce the impact of a loss of component cooling by providing a means to maintain the <u>reactor coolant pump seals</u> after a loss of component cooling water."	Site-specific equipment referenced
134.	5-10	7	For clarity, revise the basis for SAMA No. 96 as follows, "This would allow extended use of high-pressure safety injection after the <u>Saltwater System loss, which causes the ECCS pump room coolers to be lost</u> ."	Addition of language to clarify statement
135.	5-10	12	The modification proposed by SAMA No. 7 provides a benefit whenever room cooling is lost, not just in the event of a station blackout event. Therefore, the basis for this SAMA should be revised as follows, "This would <u>improve the reliability of AFW when room cooling is lost</u> ."	Clarified SAMA basis as suggested
136.	5-10	28-32	The SAMAs to improve DC power reliability provide a benefit not only during station blackout events, but whenever battery charging is lost. Therefore, the basis for SAMA Nos. 31 and 32 should be revised as follows, "This would extend the availability of DC power <u>when battery charging is lost</u> , thereby reducing the frequency of long-term station blackout core melt sequences <u>and other losses of 125V DC power core melt sequences</u> ."	Clarified SAMA basis as suggested
137.	5-10	36 and 40	Cross-tying 4 kV buses does not reduce the frequency of station blackout core melt sequences. This part of the basis for SAMA Nos. 33a and 33b should be deleted.	Misleading statements deleted
138.	5-10	44	The SAMA to use a portable generator to feed the 125V DC buses would provide a benefit during other losses of 125V DC, in addition to station blackout sequences. The basis for SAMA No. 34 should be revised, as follows: "... thereby reducing the frequency of long-term station blackout core melt sequences <u>and other losses of 125V DC power core melt sequences</u> ."	Clarified SAMA basis as suggested

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
139.	5-10	47	The SAMA to replace the batteries with a more reliable model theoretically would provide a benefit during other losses of 125V DC, in addition to station blackout sequences. The basis for SAMA No. 36 should be revised, as follows: "... thereby reducing the frequency of long-term station blackout core melt sequences <u>and other losses of 125V DC power core melt sequences.</u> "	Clarified SAMA basis as suggested
140.	5-11	21	The SAMA to provide an automatic bus transfer feature for the 120V vital AC system would reduce the frequency of spurious safety system actuation sequences, not station blackout core melt sequences. The basis sentence should be revised as such.	Corrected technical statement
141.	5-11	46	The SAMA to increase the capacity of Condensate Storage Tank (CST) No. 12 would provide the benefit of reducing the frequency of long-term loss of feed core damage sequences, not station blackout or steam generator tube rupture sequences. Therefore, the basis for SAMA No. 69 should be revised, as follows: "... thereby reducing the frequency of long-term <u>loss of feedwater core damage sequences,</u> and other core damage sequences."	Corrected technical statement
142.	5-12	7	The SAMA to automate demineralized water make-up to CST No. 12 would reduce the likelihood that CST No. 12 would be depleted during events that require CST No. 12. The primary benefits are reducing long-term loss of main feedwater, core damage scenarios (e.g., loss of offsite power), and loss of Service Water and Component Cooling Water make-up scenarios. Therefore, the basis for SAMA No. 74 should be revised, as follows: "... would permit continued inventory make-up to the CST during a <u>loss of offsite power,</u> thereby reducing the frequency of long-term <u>loss of feedwater core melt sequences, as well as enhancing Service Water and Component Cooling Water System make-up capabilities.</u> "	Revised SAMA basis to include additional clarifying information
143.	5-18	9	Change sentence beginning, "BGE determined that one . . .," to "BGE has determined that one of these SAMAs <u>may be</u> cost beneficial when . . ."	BGE's uncertainty of SAMA benefit reflected in revised language
144.	5-19	35	The SAMAs that lead to greater benefits for Unit 2 are those involving improvements to the emergency diesel generators and their support systems, not the electrical systems.	Corrected systems involved in SAMA analysis of improvements for Unit 2
145.	5-22	25	The bounding estimate for SAMA 48a indicates: "... a <u>17 percent, 0.11 person-Sv (11 person-rem)/reactor-year</u> reduction in offsite dose."	Dose corrected
146.	5-23	28	The bounding estimate for SAMA 49 indicates: "... a <u>17 percent, 0.11 person-Sv (11 person-rem)/reactor-year</u> reduction in offsite dose."	Dose corrected

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
147.	5-25	32	The subject of reference (BGE 1998c) should be <i>Severe Accident Mitigation Alternatives</i> not <i>Response to Question No. 23</i> .	Reference corrected
148.	6-7	37	The proposed rule to amend 10 CFR 51.53 (c)(3)(ii)(M) addresses assessments of the environmental impacts associated with burnup to 62,000 MWd/MTU, but the draft SEIS indicates that average burnup rates up to 60,000 MWd/MTU are addressed in the evaluation supporting the proposed rule. The draft SEIS should be revised, as follows: "... with average burnup for the peak rod to current levels approved by NRC up to <u>62,000</u> MWd/MTU are found to not appreciably change the impact values contained in 10 CFR 51.52(c) ..."	Rewrote Chapter consistent with revised rule
149.	7-3	10	[editorial correction] "The impacts would not <u>be</u> increased ..."	Typographical correction
150.	8-1	33	There is no (NRC 1996a) in Section 8.3. This should be (NRC 1996).	Reference corrected
151.	8-3	10	It is suggested that the text, "and these are discussed in Section 8.2.4." be added to the end of the sentence identifying the types of alternative energy options that were evaluated.	Inserted reference to appropriate subsection
152.	8-4 8-5 (line 25) through 8-6 (line 2)	5	The draft SEIS indicates that converting 360 ha (900 acres) of the CCNPP site to industrial use for the coal-fired generation alternative would be "... a detectable change that would noticeably alter the present land-use pattern," but would not destabilize any important attribute. This is consistent with the definition of a MODERATE impact presented on page xiv. However, the draft SEIS concludes that the land-use impacts of this alternative would best be characterized as SMALL.	Changed impact to Moderate in Table 8-2 and text
153.	8-7	9	This sentence indicates that groundwater use is at a current average of 0.02m ³ /s (450,000 gpd), but this is actually the permitted limit. The current average is actually 1.89×10 ⁻² m ³ /s (392,000 gpd), as noted in Section 2.2.2, Water Use. (See comments for pages 2-18, line 3 and page 4-27, line 3.)	Changed number to correct value.
154.	8-9	13	[editorial correction] Add the word "of", as follows: "... large amounts <u>of</u> fly ash ..."	Typographical correction made
155.	8-10	42-43	"... inventories would be required for lands not previously disturbed to the extent that no archaeological or historical resources might remain (e.g., Lake Davies)." This is an inappropriate example, as Lake Davies is part of the previously disturbed land.	Deleted reference to Lake Davies
156.	8-11	27-28	"consumption" implies that the cooling water is used and lost [e.g., evaporation]. Blowdown is not consumption. Blowdown is a non-consumptive use in which the wastewaters are returned to the Bay. Also, on line 28, it is unclear what is meant by the term "tempering water." Please ensure that the correct terminology is used.	Words originally taken directly from ER, clarified text
157.	8-12	6	Comment column for Ecology impact should read, "... impact to terrestrial ecology from salt drift."	Typographical correction
158.	8-14	17	Remove "per hour" after 440 MW.	Unit corrected

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
159.	8-15	Table 8-4	Land use under the greenfield site total acres should be revised from 110 to 500 acres according to text on page 8-16, lines 15-20.	Revised table
160.	8-22	33	There is no Section 8.2.5 in this document; the discussion of imported electrical power, including a reference to Canadian hydropower is presented in Section 8.2.3.	Typographical correction
161.	8-24	9	The incorrect reference (BGE 1998) is cited. The correct reference should be BGE's RAI response dated November 20, 1998.	Revised reference
162.	8-24	20	The unit name is " <u>C. P. Crane CT.</u> "	Power plant unit name corrected
163.	8-26	3	The incorrect reference (BGE 1998) is cited. The correct reference should be BGE's RAI response dated November 20, 1998.	Revised reference
164.	8-26 and 8-27	Refer.	The BGE and MDE citations should be listed in chronological order.	Reference order corrected
165.	9-1	25	The text notes, "... (SEIS) presents the staff's preliminary analysis of the environmental impacts ...". The word "preliminary" sounds like there is more analysis to be performed and that the ER/SEIS is the first step. It is recommended that "preliminary" be deleted or replaced with "draft."	"Preliminary" deleted in final SEIS
166.	9-4	23	The draft SEIS identifies an adverse impact, whereby: "Assuming the current pumping rate, the additional drawdown of water at an offsite well during the renewal term attributable to CCNPP operation is estimated to be less than 2 m (5 ft)." This is the first time in this document that this value is introduced; therefore, a discussion of its origin should be added to Section 4.5.1. Additionally, there is some uncertainty as to the location of the offsite well (possibly a hypothetical well located at the site boundary), and the pumping rate used to calculate this drawdown.	Added discussion to 4.5.1.
167.	9-4	26	This bullet indicates that a continued loss of fish and shellfish due to entrainment and impingement is inevitable, despite mitigative actions instituted in 1974. It is unclear what mitigative measures were implemented in 1974. Several mitigative actions that have been implemented since plant construction are discussed on page 4-11, lines 9 through 11. If page 9-4 is referring to the same measures, it should be revised to read, "Continued operation of CCNPP will result in continued loss of fish and shellfish due to entrainment and impingement despite mitigative measures instituted <u>since plant construction.</u> " If this is referring to other measures, they should be described in Section 4.1.2.	Wording changed to reflect all relevant mitigative measures implemented
168.	9-4	29	This sentence should be revised, as follows: " <u>The bounding estimate of an additional 60 employees at CCNPP . . .</u> " (See comment for page 4-19, line 20.)	Changed to reflect estimate of additional employees is a bounding rather than projected estimate

Table A-2 (Contd.)

No.	Page	Line Nos.	Comment	Disposition
169.	9-4	43-46	The draft SEIS identifies permanent storage space for the spent fuel assemblies as a resource commitment associated with continued operation of the plant for an additional 20 years. Section 9.1.2 should be revised to clarify that the permanent storage space for spent fuel assemblies will be located at a permanent high-level repository, and not at the CCNPP plant site.	Added "offsite" to sentence to clarify permanent storage siting
170.	Appendix E		Appendix E of BGE's ER includes the State Historic Preservation Officer response to the consultation letter. The response letter should be added to Appendix E of the draft SEIS.	Added letter form ER to Appx E of SEIS

Appendix A

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A.2 Public Meeting Transcript Excerpts and Comment Letters

LETTER A (Transcript)

Transcript of the Afternoon Public Meeting on April 6, 1999 in Solomons, Maryland

Mr. Gunter: My name is Paul Gunter and I am with Nuclear Information Resource Service. Chris, I have got a question with regard to the process as to how we are moving forward here with a particular in the GEIS.

When I originally read the GEIS, the transportation issue for nuclear waste -- that was a Category 2 issue. Has that been changed or has that --

A1,
A.1.3

Mr. Grimes: It is being changed.

Mr. Gunter: Being changed.

Mr. Grimes: There was a proposed -- there is a proposed rulemaking pending right now.

Mr. Gunter: Right. Well, see, I think this speaks to my concern because what we are looking at upon the board here and what we are experiencing is a little like a moving target in terms of just keeping up on the changes that are being made as this road is being paved, you know, again does not bring any increasing degree of public confidence in this process, as we see it.

A2,
A.1.3

I would like you to give me some sense, if you can right now, just how nuclear waste transport moved from a Category 2 issue, which was an item that we could have spoken to, now to a Category 1 issue? Because my suspicion is that again the NRC has acquiesced to an industry lobby effort to take yet another issue off the table.

I am wondering if you can clarify that for me.

Mr. Grimes: Yes, I would be happy to, because we prefer not to think of it as taking issues off the table but putting them in their proper place.

There is rulemaking that is going on to address certain issues on a generic basis rather than have them resolved on plant after plant. If the same answer is going to apply to all plants, then we treat those issues generically, just as we did when we originally issued the proposed changes to Part 51 that depended on that generic environmental impact statement and the newspaper accounts that describe us as acquiescing to industry pressure or to public pressure or to Congressional pressure are actually measures of how we are reacting to questions about efficiency and effectiveness and to the extent that you

| have concerns about the generic issues associated with waste handling or waste transportation or waste disposal, those issues are being addressed on a generic basis and that is the appropriate forum for any interested public to engage us.

| We are obliged to address those things to all interested parties, not just on a one plant specific basis.

| **Mr. Gunter:** Could I just follow up? I don't need the microphone.

| **Mr. Cameron:** You do.

| **Mr. Gunter:** Okay. So this is, what we are looking at is a draft report.

| **Mr. Grimes:** That's correct.

| **Mr. Gunter:** Okay. Did the industry, were the industry comments filed on this? I am trying to get some sense -- obviously this is a moving target and I am trying to get some sense of where the public retort is to industry comments on this in terms of, okay, so the industry obviously wants to take transportation off the table and in your eyes that is putting it in the more appropriate place, but have they done that by rulemaking?

| **Mr. Grimes:** It is a rulemaking that is out for public comment right now.

| **Mr. Gunter:** Okay. Can you give me a Federal Register cite on that?

| **Mr. Grimes:** I would be happy to.

| **Mr. Cameron:** Yes, I think that it may be helpful to clarify for everybody here that doing something through rulemaking is a public process and there is a proposal issued that people can comment on and Chris will provide that Federal Register notice.

| One other question that comes up that Paul raised I think -- are the comments that anybody files on the draft environmental impact statement, are they being posted on the web as they come in like comments on a proposed rule are, or they will only be available -- are those comments available somehow?

| **Mr. Kenyon:** I am Tom Kenyon. I am the Environmental Project Manager. It wasn't our intent to post them on the web. However, when we issue the -- they are available through the public document room. They can be obtained through the PDR and we will be putting all the comments and their disposition in the final environmental impact statement in the Appendix A to the document.

Mr. Cameron: Okay, thank you, Tom, but if someone wants to look at another party's comments before they file, assuming that those -- they can look at those comments that have already been filed by going to the NRC's public document room?

Mr. Kenyon: That's correct.

[Discussion]

Mr. Mills: My name is Robin Mills. I am Director of the Maryland Safe Energy Coalition. You stated previously in your comments that all the parts could be replaced or refurbished. In reference to that statement, how do you plan to replace or refurbish the reactor pressure vessel as the nil ductility transition temperature is increasing due to neutron embrittlement and defects caused in the metal? A3, A.1.12

Mr. Grimes: The repair or replacement of the reactor vessel has a variety of different concepts that have yet to be demonstrated, but are being tested in foreign countries. Right now there are experiments ongoing that are demonstrating how annealing could be used to change the material properties of a reactor vessel and in Tokyo later this month there is going to be a paper presented by the Japanese on how they would propose to replace a reactor vessel should it come to that, but my general comment about the conclusion about the viability of license renewal was intended to -- the concept that if there is any part of the plant that does not satisfy its design requirements, it's technically feasible to repair or replace that up to and including replacing the reactor vessel, but it becomes very expensive and it becomes an economic consideration that the utility would have to face when they reach that point.

Present analysis for all of the reactor vessels in the United States indicate that they have life expectancies that approach 60 years depending on what the continued fluents on the reactor vessels -- what those measurements indicate. Some of them will fall short and they will probably end up having to shut down before the end of a renewed license life.

Mr. Mills: Just as a follow-up, there are samples of metal that are placed inside the reactor vessel. Can you tell me or do you know how many samples remain at Calvert Cliffs to test the nil ductility transition temperature over the 60 year lifespan? Are there enough samples left to prove that the reactor vessel is safe? A4, A.1.12

Mr. Grimes: The answer I believe is two specimens left in the vessel, although I am not sure, but I also know that there are plants that are using data from other vessels and they have programs for sharing information on the material conditions so even if there weren't any specimens there would still be an adequate database for the vessel to project its material conditions.

| Some of those details are described in the safety evaluation report that we issued on
| Calvert Cliffs and on the other plants. We have routine reports on the material specimens
| when they are submitted and when those are available publicly.

| **Mr. Cameron:** If someone wants to get a copy of the SER that discusses those issues,
| we'll be able to tell them how they can get a copy?

| **Mr. Grimes:** Yes.

| **Mr. Cameron:** Are there any specific meetings coming up between the NRC and the
| licensee on the nil ductility or any of the issues that Robin was talking about?

| **Mr. Grimes:** Not on those specific topics. However, I imagine that those will most likely be
| covered during the ACRS meetings, and so if you have an interest in those topics, I would
| encourage you to attend the ACRS meetings.

| **Mr. Mills:** Is that still an open item?

| **Mr. Cameron:** The question is, is it an open item? The answer is?

| **Mr. Grimes:** I don't believe so. I think that section might have had a confirmatory item.

| [Discussion]

| **Mr. Lochbaum:** My name is David Lochbaum, with the Union of Concerned Scientists.

| I looked at the safety evaluation report that the NRC issued in March of '99 and the question
| it has on this process. The comment period for both the environmental and the license
| application of Part 51 and Part 54 started on July 8th of last year and ended on August 7th.

A5, Since that time Baltimore Gas & Electric, according to Appendix A to safety evaluation
A.1.3 report has supplied 47 supplements to the original application. In counting up the pages, it
| is more than the original application, so basically an incomplete and inaccurate document
| was submitted to the public to provide comments on.

A6, After that time the public doesn't have a chance for the hearing that's shown up on your
A.1.3 drawing here. Any issue that comes up as a result of the review of this 47 additional
| information, you don't have a shot at a hearing. That doesn't seem to us to be a fair
| process -- where the public gets to watch but doesn't get to participate.

| Do you see that as a fair process?

Mr. Grimes: We believe it is a fair process and it is a longstanding process in terms of filing an application, having the regulatory authority ask questions and exchange information. The fact that this was the first of a kind in terms of the format and content of an application, I am surprised at the amount of information that flowed back and forth, not necessarily supplementing the application as much as simply clarifying it and allowing us to test it.

With regard to the hearing process, the standards for establishing a formal adjudication of issues, it normally sets out to be conducted in parallel with rather than sequentially, and that is not unique to this licensing process. It is typical of all licensing processes.

Mr. Lochbaum: In the original licensing there were two stages. You had a hearing process at the beginning and a hearing process between the safety evaluation report and the original license being granted.

The second one has been taken out and it was taken out, we feel, so that the public doesn't have a shot in determining the outcome.

A7,
A.1.3

Mr. Grimes: The public can petition at any time -- and I would encourage you to -- we are continuing to work with the UCS and others in terms of trying to improve those processes, but from the standpoint of this process, identifying issues to be litigated at the beginning is the same process and the same concept that was applied when a petition or when an application was received for an operating license and that was --

Mr. Lochbaum: No. It's different. It is significantly different.

In the beginning you had two opportunities for public hearings, now you have one. This one you have to look at a document in 30 days that the NRC Staff has estimated it will take 22 manyears to review and come up with contentions, and now you are locked out, and you consider that to be that same as the original licensing?

A8,
A.1.3

Mr. Grimes: Yes, I do.

Mr. Lochbaum: It's both the NRC but other than that it is not --

Mr. Grimes: From the standpoint, as I said before, of the policy statement that the Commission has issued in terms of whether or not there are issues that should be formally litigated, the petitioner first has to identify that there is something worth litigating, and that is, in our view, comparable, but to the extent that -- you know, your concerns about where the public involvement should be and what information should be available, you know, the Commission will consider those in terms of whether or not there is a better process -- and to identify a better process that you think would still achieve the desires of efficiency and effectiveness.

| **Mr. Cameron:** Okay. We have I think a clarification here from the Office of General
| Counsel and then we have another comment up here.

| **Ms. Zobler:** Marian Zobler, Office of the General Counsel. Just to clarify, I think Mr.
| Lochbaum is thinking of a construction permit and an operating license, two different
| licenses, two different processes. And Mr. Grimes: is correct that what -- I'm sorry, can you
| hear me? I am not used to microphones. I also have a bit of a cold. I apologize.

| And what Mr. Grimes: said is correct, is that the normal process, 30 days to request a
| hearing after the notice availability, then at such time later a licensing board will establish a
| time for the filing of what the NRC calls contentions. If you are familiar with NRC practice,
| you know what those are. Very specific safety concerns that a petitioner may seek to raise.
| And I just want to clarify in case there is any confusion.

| **Mr. Grimes:** I would also to emphasize, --

| **Mr. Cameron:** Thanks, Marian.

| **Mr. Grimes:** -- you know, we are trying to point out that besides -- and forgive me, Marian,
| but besides keeping lawyers employed and taking issues to court, we conduct all of our
| activities in a public forum, and we invite the public to watch and question. We offer the
| public an opportunity to attend meetings and to ask questions, and to make comments.
| And as I said before, the ACRS meetings are transcribed meetings and those comments go
| into the record as part of the decision. Yes, ma'am.

A9, **Ms. Dellinger:** Can the public petition to close Calvert Cliffs?
A.1.3

| **Mr. Grimes:** Yes, ma'am.

| **Ms. Dellinger:** We can?

| **Mr. Grimes:** Certainly.

| **Ms. Dellinger:** When can we do it?

| **Mr. Grimes:** Any time. But you have to have good cause.

| **Ms. Dellinger:** And that means that we have to file a lawsuit to close it?

| **Mr. Grimes:** You can make petition to the Commission at any time to take what you
| believe is an appropriate action. Under 10 CFR --

Ms. Dellinger: Well, I think there are a huge number of people who would like to file a petition to close Calvert Cliffs.

Mr. Cameron: You may, in summary, in terms of the public having an opportunity to comment on the technical issues, the aging management issues, they can come to the meetings that are going to be held. They can file what is called a 2.206 petition that is named after the section in the NRC's rules that allows any member of the public to file a petition requesting action against any licensee. That is the scope of the public comments at this point. Is that correct, Chris?

Mr. Grimes: That is correct.

[Discussion]

[Presentation Mr. Kenyon]

[Presentation Ms. Parlhurst]

Mr. Doroshuk: I'm Barth Doroshuk, the Director of the License Renewal Project. I believe the finding that or the conclusion we drew is that there would be no refurbishment outside the powerplant that would affect -- there was no refurbishment to be conducted that affected anything outside the perimeter of the powerplant.

A10,
A.1.4

[Discussion]

[Presentation Ms. Parkhurst Continued]

Mr. Lochbaum: I have a question.

Ms. Parkhurst: Yes.

Mr. Cameron: Let me get you a microphone, David.

Mr. Lochbaum: David Lochbaum with Union of Concerned Scientists.

When you talked about the housing effects, you said 60 employees that might lead to 190 housing units because of 580 additional people. Public transportation, you talk about no impact from 60 employees. Those 530 other people are not included in the public transportation study?

A11,
A.1.7

Ms. Parkhurst: They're included, and primarily, though, what you're getting is -- you know, the plant traffic, I would presume, is very heavily what -- that 60 doesn't add much to. But yes, they're included in the overall analysis on the transportation. Thank you.

[Presentation Ms. Parkhurst Continued]

| [Discussion]

A12, | **Mr. Mills:** Yes. About that, on page 5.3 here, you have a design -- let's see. BG&E
A.1.10 | estimated the core damage frequency at 3.3 times ten to the minus four per reactor year; is
| that correct?

| **Ms. Parkhurst:** Can somebody help me?

| **Mr. Mills:** Page 5-3, next to the last paragraph, core damage frequency --

| **Ms. Parkhurst:** I think we're on severe accident mitigation there. I think you're jumping
| into the next section. This is the design- basis accident. This is 5.1.

| **Mr. Mills:** Oh, I'm sorry.

| **Ms. Parkhurst:** Yes. You're jumping ahead, and I'm going to give you just enough
| information to say we're going to delay this one --

| **Mr. Mills:** All right.

| **Ms. Parkhurst:** -- later on.

| [Presentation Ms. Parkhurst Continued]

| [Discussion]

A13, | **Mr. Mills:** I don't see the effects of an accident listed there. Now, I know it is a small point,
A.1.10 | but as I look at page 5-3, it states that the risk of an accident over license extension is 1 in
| 150, core damage frequency. There is going to be a meltdown, one chance in 150. That is
| the way I figure out these statistics, point -- 3.3 times 10 to the 4th times 20 years works out
| to one chance in 150 that there is going to be a meltdown. Okay. Is that right? Do I have
| that right? .00033 --

| **Ms. Parkhurst:** Bob, I think we will let Bob --

| **Mr. Mills:** Times 20, one in 150.

| **Ms. Parkhurst:** This is again --

| **Mr. Mills:** Now, you are saying that that -- if we have a core meltdown, that is a small
| effect? The effect here is small.

Ms. Parkhurst: I am saying this is not -- the accidents are not included in this. The severe accidents is a separate issue.

Mr. Mills: Okay.

Ms. Parkhurst: Bob will talk about it next.

Mr. Mills: Accidents is not an environmental effect?

A14,
A.1.10

Ms. Parkhurst: Now, that is -- I think that I am still going to have to pass this on to NRC. This part of the analysis, this part of the environmental effects are separate from what you are talking about, and, yes, actually, they come out with a small significance even on their severe accident, as part of the GEIS analysis, so that is indeed correct.

Mr. Mills: Okay. I think you should include that, though, in environmental significance of license renewal.

Ms. Parkhurst: Thank you for your comment.

[Discussion]

[Presentation Ms. Parkhurst Continued]

Mr. Lochbaum: David Lochbaum with Union of Concerned Scientists. You mentioned that there has been a lot of studies that show that shellfish and the fish that are captured on the intake screen and system survive that, many of them survive. Are you aware of any studies that show that humans living around the plants are not dying earlier because of radiation releases?

A15,
A.1.6

Ms. Parkhurst: We are going from impingement to human radiation on this one, is that what you are offering on that?

Mr. Lochbaum: I was just looking at -- you looked at shellfish. I assumed you looked at humans to the same degree.

A16,
A.1.3,
A.1.6

Ms. Parkhurst: Okay. There is some question here. This is an issue that, again, is outside the -- well, there are category 1 issue portions of this, but it is outside the realm of the Environmental Impact Statement. The levels of releases at the site are under continual monitoring surveillance by the plant and that is something that NRC has active programs, continuing to make sure that they stay well within limits. That really is not a part of this impact statement.

Mr. Lochbaum: On page 2-23 of your report, you do talk about some of those, looking at the radiation limits.

Ms. Parkhurst: Yes.

Mr. Lochbaum: There is a book that came out recently that shows that for the two counties, Calvert and Prince George's, there is a 15 percent higher mortality rate for white females from breast cancer since the plant has operated than before the plant was operated, and I just wondered why that is excluded from an environmental impact study.

Ms. Parkhurst: Again, I should go back, mentioning a little bit in Chapter 2, where he is talking about the radiation monitoring, other effects. This is descriptive material provided for background information only. This particular kind of issue was not intended as a part of the Environmental Impact Statement and is not included in this. And I suspect that since that time there have been many other changes in society that we probably could be talking about, but I think we will leave that issue and see if there is any other comments NRC wants to add on that.

Mr. Grimes: Yeah, I will just -- I will add that the --

Mr. Cameron: Chris Grimes.

Mr. Grimes: The limits that are used for effluents from nuclear power plants are constantly being reviewed and challenged by studies such as the one that Mr. Lochbaum described. There are also datasets that show other trends, different trends, but we constantly look at those kinds of studies, and that information in order to determine whether or not there are any insights related to the radiological protection standards, because those apply today as well as in the future.

Mr. Gunter: Paul Gunter, Nuclear Information Resource Service.

A17, My question goes to the movement of the transportation of high level nuclear waste from a
A.1.3 Category 2 issue, as it was addressed originally in the original supplement, being moved to a Category 1 issue.

First of all, I would like to know, can you just give me a little bit of background in the audience, a little bit of background on how this movement originated?

Ms. Parkhurst: In the Calvert Cliffs site or in NRC's proposed rulemaking and so on?

Mr. Gunter: Obviously in NUREG-1437, Supplement 1, obviously Staff considered transportation a Category 2 issue for NRC. Subsequent to the issuance of the draft, comments have been received to again take this issue off the table and I want a little bit of history on how this issue arrived before Staff and appears different than what is in this document before us today.

You know, I understand that it is by rulemaking but can you give us -- I want some information on how this issue evolved into a rulemaking? Who applied for the rulemaking and how we are proceeding here?

Ms. Parkhurst: Don, is that one that you would be willing to discuss here?

Mr. Cleary: I am Don Cleary, NRC.

I am in the rulemaking section of the branch that has been mentioned. This rulemaking came about at the time the final rule, Part 51, license renewal rule, was published in December of 1996. At that time we recognized that there were two areas that were not adequately treated in our analysis of transportation.

One was we had a new -- Table S-4 has fuel, spent fuel being transported to multiple locations. We are faced now with the candidate site, one site, Yucca Mountain. That analysis had not been done for Table S-4.

The second area is utilities were using, going to higher enriched and burnup fuel -- higher enriched fuel and burning it longer than was covered in Table S-4, so at the time in the Federal Register notice when we published the final rule, the Commission stated that it would review these issues in the future and that is what we are doing.

Mr. Gunter: Okay. Who was the petitioner for the rulemaking?

Mr. Cleary: There is no petitioner. The Commission recognized a piece of analysis that was undone and said that it would do that analysis in the future, which is what we are doing now.

Mr. Gunter: Okay. How come that is not noted in the draft -- this draft document?

Mr. Cleary: I will have to defer to the people that were responsible for that document.

Ms. Parkhurst: Yes. This is partly a timing thing. Tom Essig actually was responsible for the -- who is in the same organization -- if he were here today probably could provide you with more of that information than those of us here.

Mr. Gunter: Well, I can only say that, you know, it remains a concern. If you are trying -- if this agency is trying to build public confidence in this -- in having adequate oversight, safety oversight, of public health, public safety, that you are not gaining it by continually to provide us with dwindling documents where issues -- obviously, you know, you are saying that transportation is a generic issue, but there are unique situations in this county in terms of roads, in terms of population densities, that should be granted special consideration, particularly because this is the first license renewal to be submitted.

| It gives you an opportunity to look deeper into some potentially dicey issues, but instead of
| actually taking it on, embracing it, as you have termed it, we see these issues being
| sequestered from the public venue, from the public's ability to address it, and that is -- I
| think that is irresponsible, and it only portrays the NRC in this role of no regulatory criteria,
| rather than a regulator.

| **Ms. Parkhurst:** Don, isn't this in the vicinity of the repository that we are talking about
| here?

| **Mr. Cleary:** Yes. I would like to clarify that there are really two transportation issues.

| There is the local transportation issue which is associated with increased workforce,
| increased population. That is still being addressed and that is separate from the
| transportation issue that I was referring to, which is strictly the transportation of spent fuel.

| Transportation of spent fuel is covered in Table S-4. What is uncovered is all of that fuel
| converging on one location as opposed to multiple locations and that is all the rulemaking is
| handling.

| **Mr. Cameron:** Okay. I think we are going to come back up here to Jim. We have a
| question back here, but the point being that local transportation issue are still within the
| purview of this environmental impact statement?

| **Mr. Gunter:** Category 2 --

| **Mr. Cameron:** You just make sure everybody understands local transportation and how
| that fits into this.

| **Mr. Cleary:** One part of the rulemaking which I didn't mention is really an administrative
| correction for local transportation in the GEIS. Local transportation at the time of -- during
| the operating period was not picked up -- the conclusions were not picked up in the table.
| Transportation during refurbishment is Category 2. It was not specific for the operating
| period.

| The rule that we have out for public comment notes that this was an oversight and notes
| that transportation should be covered for both the refurbishment and the operating period,
| local transportation impacts.

| [Discussion]

| **Mr. Reynolds:** I had a comment. I have been sitting here for about two and a half hours
| now.

My name is Chris Reynolds. I am a resident here in Calvert County. I work here. I play here. I spend money here. I get the impression I am watching a Kabuki play or something. You all give your presentation and it is interesting and it is important for us to hear it, and I don't mean to knock any of the points that you gentlemen and ladies in the upper right-hand corner here are making either, but you are debating stuff you all have talked about before. The purpose of holding the hearing here in Calvert County is to hear Calvert County residents. I appreciate what you have said. Make your comments up in Washington and Rockville, where the Nuclear Regulatory Commission Headquarters are located and would you get moving please.

Mr. Cameron: And you, from a Calvert County perspective, do you have anything to ask on this particular portion at this point?

Mr. Reynolds: No, sir -- on procedures --

Mr. Cameron: Okay. Then we will give you a chance to that. Yes, sir? Is it on this particular section? Okay.

Mr. Mihursky: Thank you. I would ask for five minutes to add a statement for the public record. I am Dr. Joseph Mihursky, a university professor, and I have been an employed ecologist for a little over 40 years.

For many years I ran a field and laboratory research operation concerned with environmental effects of energy conversion systems such as nuclear power plants.

Here in Maryland our study sites included a region around Calvert Cliffs as well as four other power plant sites. We were recognized as a center of excellence by Federal agencies in the state of Maryland.

I have been an advisor to other U.S. states, the Federal Government, and other nations of the world on these same environmental matters.

Regarding power plants, we made a number of recommendations about site selection, engineering designs and operational features that in the main were implemented by BG&E in order to minimize biological damage to the local bay system. I heartily comment BG&E for doing so. The Calvert Cliffs plant, which requires about 15 square mile feet of water per day, to release its waste heat, does affect pumped, entrained and impinged organisms because of required bay water pass-through of its heat exchange system.

Organisms such as phytoplankton, zooplankton, shellfish and fin fish eggs and larvae, small fish as well as combed jellies and jellyfish may be damaged or killed because of the large hydraulic mixing and diluting circumstances' effects upon bay organism population dynamics is debatable or difficult to assess, especially if you are doing this on a wide regional, baywide scale.

- | Hydraulic and physical discontinuities of current velocities and temperature do influence
| normal seasonal behavior of mobile species such as fin fish. Also water velocity has
| scoured about a 90 to 100 acre area in the high velocity discharge zone and has resulted in
| changed benthic community structures.
- |
| Although the above incremental effects on the local bay system are known, the state and
| Federal regulatory agencies have deemed them acceptable in return for electricity
A18, production. Now although BG&E has worked hard at being a good neighbor, personally I
A.1.2 would prefer having a more benign and lower risk electricity-producing system in operation,
| as I do live within the 10-mile radius of risk concern.
- |
| I do understand in detail the process and procedures that led to the installation at this
| location by BG&E. The past is done. My existing concerns as a local informed citizen of
| Calvert County for 38 years are five-fold.
- |
A19, One is continued storage of spent radioactive material onsite, but I recognize the
A.1.13 complexities of this national problem.
- |
A20, Two is the eventual issue of decommissioning, burial costs, and future care and protection
A.1.14 of the facility.
- |
A21, Three is the question of biological effects of batch release of radioactive tritium to the bay.
A.1.5 Although tritium is a weak beta emitter, it can be incorporated with water into the cell
| nucleus of rapidly developing, early life history stages of bay organisms such as oysters,
| clams, fish and so forth. What does tritium uptake mean to the genetic well-being of key
| bay organisms? I am not aware that this question has been addressed at the Calvert Cliffs
| site.
- |
| Some years ago I was part of a Federally-appointed team to oversee the decontamination
| of the Three Mile Island facility after partial fuel rod meltdown and radioactive release. One
| of the recommendations eventually developed concerned precautionary measures about
| public safety whereby potassium iodide pills should be made available to every household
| and facility having children that were located within the critical area around a nuclear power
| plant.
- |
| This recommendation recognized that children are highly prone to uptake or radioactive
| iodine that may be released from a plant incident.
- |
A22, Such uptake can cause thyroid cancer problems, so my fourth concern is that since such
A.1.11 precautionary measures are being followed by other U.S. states and nations of the world,
| why is such a policy not pursued here by Government and management in the Calvert Cliffs
| region?
- |

My fifth and final concern is a metallurgical one. I realize that a nuclear power plant is an awesome engineering accomplishment but I also recognize that in the earlier days we did not have a sufficient database on the effects of long-term radiological emissions upon metallurgical properties. A23, A.1.12

We now know that brittleness is one of the consequences of this exposure and results in blows of welds and piping. How is this substantial problem going to be avoided as this facility continues to age?

I would like to submit these for the public record and thank you for the opportunity to comment on this very important societal matter. Thank you.

[Discussion]

Mr. Riccio: Hi. My name is Jim Riccio. I am the staff attorney with Public Citizens Critical Mass Energy Project.

As much as I liked the gentleman's comments in the back, the reason we are here is because this plant has the potential of affecting our back yard as well. We are only 40 miles away and an accident in this facility could easily wipe out my neighborhood as well.

One thing I would like to address is I am glad to see you are addressing the health impacts of electromagnetic fields. That is going to be interesting. I wish you would look at the health impacts of chronic exposure to low dose radiation. The last couple of BEIR reports that have come out have found that the numbers we were using from Hiroshima-Nagasaki data were well underestimating, six to eight times underestimating what we were getting in terms of chronic low dose exposures. A24, A.1.6

There was a recent study done by UCLA which I wish you would incorporate into your work as well that was done on Rocketdyne workers. They basically found that -- and actually one of their conclusions was that before we move ahead with exposing the public to more and more chronic low dose radiation that we should take a look at our standards and re-evaluate them in light of new data.

I realize that parts of this may not necessarily affect your generic environmental impact statement, but I wanted to follow up on Dave's comments -- and I will be happy to save my SAMA comments for later.

Ms. Parkhurst: Thank you. Yes, we are aware of that particular study and the objections to it as well, and it goes to part of the continuing NRC look at what the effects appear to be. NRC continually reviews that.

[Discussion]

Ms. Parkhurst: Okay.

Mr. Abbe: Some of you heard these comments in July. Some of you have not. I have been requested to repeat them.

My name is George Abbe. I am a Senior Scientist with the Academy of Natural Sciences Estuarine Research Center, located in St. Leonard, Maryland.

I have been a research scientist with the Academy for almost 32 years now, working primarily with blue crabs and oysters in Southern Maryland. I am also currently serving as President of the National Shell Fisheries Association, which is an international society of over 800 scientists who work with shellfish such as clams, oysters, scallops, shrimps, crabs, lobsters and similar organisms.

That honor will be passed on to a new President when we meet in Halifax later this month. Today, however, I would like to speak to you as a Senior Scientist with the Academy.

A25, Academy scientists began working in the Chesapeake Bay near Calvert Cliffs in 1968 under
A.1.5 contract with Baltimore Gas & Electric. Our goals were to determine whether the generation of electrical power and subsequent discharge of heated water from the Calvert Cliffs nuclear power plant had significant effects on water chemistry, phytoplankton, zooplankton, epifauna and benthic organisms, shellfish and fish.

Our preoperational studies at Calvert Cliffs were conducted for seven years until Unit 1 began to generate power in 1975. We continued these studies for another seven years until 1981. Results of these studies appear in numerous scientific reports, peer reviewed journal articles and a book published in 1987 by Springer-Verlag entitled, "Ecological Studies in the Middle Reach of Chesapeake Bay: Calvert Cliffs," edited by Kenneth L. Heck, Jr.

I am unable to detail results of all these studies because of time, since that would take days, but we detected relatively little effect of power generation at the Calvert Cliffs nuclear power plant on the aquatic organisms that live in the Bay immediately adjacent to the plant.

Although there was damage to some small organisms drawn through the plant in the cooling water and to some of the fish impinged on the travelling screens, the damage was generally minimal and as long as numbers are not large, fish injured or killed by the plant are not lost to the ecosystem, but simply provide food for other fish and crabs in the area.

There have been a few instances since 1975 when fish losses were significant, but BG&E usually sought our advice and was responsive in its efforts to minimize these losses.

Oysters that we placed in the discharge area grew slightly faster than similar organisms or similar oysters that we held some distance from the plant. Oyster mortalities were

unaffected, averaging about 7 percent before and 6 percent after the start of power generation. Analysis of 16 years of crab population data beginning in 1968 showed that the percentage of the catch made at stations in the vicinity of the Calvert Cliffs plant were nearly identical during both preoperational and operational periods and catches at control sites were nearly the same as near the plant.

After these initial studies, during the 1980s and 1990s, BG&E continued to fund additional research projects focusing on oysters and crabs in the vicinity of Calvert Cliffs. We now have a 31-year dataset on blue crabs near Calvert Cliffs that recently provided much of the input to the stock assessment of Chesapeake Bay blue crab, *Callinectes sapidus*, conducted by NOAA's Chesapeake Bay stock assessment committee and is currently part of the database used by the technical work group of the bi-state blue crab advisory committee in its efforts to manage this last great fishery of the Chesapeake.

In biology or fisheries a 5 or 10 year dataset is often considered to be quite long. A 31 year dataset is not only rare, it is almost unheard of. This extremely valuable dataset is the result of long-term funding by BG&E and it is difficult for me to overemphasize this point.

In talking with colleagues around the country about this data they are amazed that a power company would do something like this for such a long period of time.

In addition, we have cooperated with state of Maryland researchers for more than 20 years in a program that transplants oysters quarterly into the discharge area at Calvert Cliffs to examine accumulation of radionuclides. While we are not directly measuring contamination, although the state is, these sentinel oysters will serve as a means for detecting unscheduled or excessive releases from the plant.

I believed early-on that Baltimore Gas & Electric had a commitment to the environment both in learning what was there and then protecting it. Their continued funding of environmental research after we had shown that the thermal discharge had little effect on local organisms is in my opinion a direct result of their commitment.

Although the blue crab research is no longer funded by BG&E, I still believe in their commitment. We remain available and interested in advising them on ecological problems they might encounter and I am committed to the environment as well. That is why our blue crab studies will continue, although now through other funding sources.

For over 30 years the Academy has served as an advisor to Baltimore Gas & Electric at both the corporate level and the plant level. At the same time we have provided oversight and scientific expertise to the state of Maryland. The fact that we are able to interact smoothly with all of these groups about topics of mutual interest in my mind underscores BG&E's interest in and commitment to the environment.

Thank you very much.

| [Discussion]

| [Presentation MR. PALLA]

| [Discussion]

|

| MR. RICCIO: My name again is James Riccio. I'm the staff attorney with Public Citizen's
| Critical Mass Energy Project.

|

A26, There are just a couple of things. First I want to address off the bat I've heard a couple of
A.1.3 things so far about this being the first plant to go through license renewal. That's not the
| case. There was a plant up in Massachusetts that tried to go through this process several
| years ago. When they tried to go through the process, they realized that the plant shouldn't
| even be operating during the current license, and the plant has since been shut down. They
| have now rewritten the rule to make sure that never happens again. Now I'm not saying
| that the process these gentlemen are going through is not substantive, and I'm not
| questioning their integrity. They're just doing their jobs and they're having to follow a bad
| rule.

|

A27, Now to get into the SAMAs, I'm glad you followed up with your IPE followup, because
A.1.10 there's nothing in the documents that even talks about the IPE followup. Basically there are
| several things that are addressed in here where they basically find that we can make this
| plant safer, but we're not going to do it because it doesn't have to do with the aging of the
| reactor.

|

| That's really unacceptable. If you know that you can improve the safety of this plant for a
| relatively minimal cost impact, I think it should be done. It says right here under -- I won't
| even bother you with the entire title, but basically they're talking about changing how the
| actuation system for the safety systems work, how the logic works.

|

| Now safety system actuations are a problem throughout this industry, and they try to be
| whittled away first off by changing the NRC regulations on how you record them. That didn't
| work too well, so now we're addressing them under the SAMAs, and it says here that this
| modification would prevent the spurious safety system actuations, which is one of the most
| risk-significant contributors to the Calvert Cliffs PRA model. Yet because it's not having to
| do with the aging of this reactor, it's not going to be addressed, at least under this license
| renewal.

|

| You know, it seems to be relatively inappropriate. If you can enhance the safety of this
| reactor, you should do it. The one thing that they're actually going to do for us is to
| basically -- they're going to put it in a watertight door. Well, that's great. They whittle it
| down from 158 design changes down to 108 which are specifically for the Calvert Cliffs
| reactor, again down to 23, they find some that might actually increase safety, but they're not
| going to do it except for putting in the watertight door.

|

This utility is about to dip into your pockets for what they're calling stranded-cost recovery. This is another term for basically the bad investment in nuclear powerplants. They're going to be asking you for millions and millions and millions of dollars. The least that they can do is dip into their own pockets and fix some of the safety problems that exist here so that if they run this thing longer, that it won't pose even more of a risk to the surrounding populations.

The other SAMAs -- the reason I like going into this section is because this isn't being done out of the kindness of NRC's heart or out of the largesse of BG&E. Some of my friends several years ago had to sue the NRC to ensure that these mitigation alternatives were taken into consideration. Now what we're finding is that when we're finding improvements, we're going to sluff them off till somewhere further down the road, but we're not going to address them in the license renewal process. It does you a disservice, it does the public a disservice, and unfortunately it also does the utility and the agency a disservice, because it lowers the credibility of both the industry and the agency in the eyes of the public.

I hope that the issues that we're addressing here today will eventually get addressed. They should be addressed before they renew the license, but that doesn't seem to be the case. So hopefully with our friends helping and getting involved in the IPE followup we can assure that these are addressed further down the line. However, if this utility knows that there are things that could be done to make this plant safer today, I see no reason why they shouldn't be forced to do it.

Mr. Cameron: Okay. Thank you, Jim.

Bob, did you want to just reemphasize what the NRC is doing about these?

Mr. Palla: Well, what we would do would be done early rather than late. If it was tied to renewal, it could conceivably be done much later. I'm agreeing, the alternatives are out there, they're on the table, they seem to make sense, so we're going to be looking at it further --

[Discussion]

[Presentation Mr. Kenyon]

Mr. Hale: Good afternoon. I am mainly here to address the NRC today. My name is David Hale, and I am the Vice President of the Board of County Commissioners. The President, Linda Kelley, will be here to testify, too, at 7:00 with I believe roughly, it not exactly, the same message.

If you take one point away from this testimony today, it is the fact that the five County Commissioners stand in unanimous support for the relicensing of this plant. I have a bunch of other points to make, but that is the one point I want you to take away today, is that the local government that surrounds this plant stands in unanimous consent in support of this

| licensing issue. As you know, it is pretty rare we get a 5:0 vote on these -- especially on
| large issues like this, but we did it today. We took the vote today so that we could come in
| front of you today and stand here and say, today we stand in unanimous consent, 5:0.

| I wasn't going to make specific comments, but I saw a couple of things on the slides I would
| like for you to address. On slide 47 and again on slide 49, you seem to evaluate
| socioeconomics, which is I believe mainly where my testimony falls into, on the decision of
A30, no action or denial, as small to large. I would ask you -- you need to put extreme there.

A.1.1 That is not small, that is not medium, that is not large. You if choose no action, it is an
| extreme impact to everyone who sits before you or lives within a 30 or 40 mile radius of this
| plant, and I just wanted -- I did bring some hard facts. I can leave the sheet with you if you
| would like.

| Calvert Cliffs is the largest employer the largest private employer in this county. They
| provide 1500 jobs to the people and over a thousand of those are to residents of this
| county. Calvert Cliffs provides 20 percent of the operating income to this county. They
| provide \$79 million in salary and \$59 million of that annually goes to this country or people
| who live in this county.

| This is where I say it is extreme. If you close this plant, or if we cannot operate under a new
| license, we are looking at on average \$600 in taxes increase per house per year. And that
| is why I don't want to see large or small in that category.

| I guess the other thing is the employees of BG&E -- it goes far beyond economics, and it is
| probably in the details which you didn't have time to present today, but you need to look at
| the impact to our volunteer fire and rescue squads, to our volunteer teacher programs, to
| our high schools, to our middle schools, to our elementary schools. If we remove this work
| force and disperse it into the winds, you remove a huge component of a service this county
| desperately needs. So, again, I am going to leave it at that.

| I appreciate you listening to me today. Please take into account that it is not a small,
| medium or large impact should you choose no action. No action is action and in this case it
| will be extreme. So, again, we stand in unanimous consent to ask you and support this
| relicensing. Thanks.

| **Mr. Cameron:** Okay. Thank you very much, Commissioner Hale.

| [Applause.]

| **Mr. Cameron:** Without getting into a long answer, the types of impacts that Commissioner
| Hale identified, are they addressed in the --

Ms. Parkhurst: In Chapter 8, they are addressed in more detail. I have got the socioeconomist here who can actually discuss this, if you want a few words.

Mr. Cameron: I don't think a socioeconomist can ever say a few words.

[Laughter.]

Mr. Scott: Two words. They are addressed. No, there are a considerable number of details concerning the existing effects of the plant on the environment and the potential effects both of closure of the plant and/or replacement plants for that. So some of what you are seeing there in characterization is, if you are looking at a closure scenario, you are also thinking about what would you have to replace it with, and so some of that information results in that range of effects.

Mr. Cameron: Okay. Thank you. I think the point was not just that they are addressed, but how they are characterized as small, medium, large. How about David -- Dr. Rogers, Dr. David Rogers?

Dr. Rogers: My name is David Rogers, I am a public health physician and I have served as Health Officer for Calvert County for the past 26 years. Of course, my beginning pre-dated the operation of the power plant. As Health Officer, I am accountable to the Board of County Commissioners, who, by statute, serve as the County Board of Health and, as such, they have a duty to look after the health and welfare of the county residents. I am also accountable to the state Secretary of Health and Mental Hygiene, of course, who has a broad responsibility.

As Health Officer, I am, of course, concerned primarily with the health of the people who live in Calvert County. I have heard a number of concerns raised about the impact of the health -- the impact of the plant on the health of the people who live in Calvert County, particularly those who live near the plant. That is, of course, a legitimate concern. I might say that my personal residence is located approximately within a six mile radius of the plant, so it is not only a matter that concerns me professionally, but also in my personal life as well.

The thing that is unique, of course, about a nuclear power plant is its potential for producing radiation. And the one that we are concerned about with radiation exposure, as far as human health is concerned, is primarily the incidence of cancer, and that is the one thing that I felt compelled to take a look at in trying to understand whether or not there has been an adverse effect on human health from the operation of this power plant in Calvert County.

A31,
A.1.6

Let me make reference, first, to a study published by the National Cancer Institute in 1990 entitled, "Cancer in Populations Living Near Nuclear Facilities." That was a study that looked at cancer mortality between 1950 and 1984 and studied the effect of some 62 nuclear facilities that were in service prior to 1982.

| Let me just read from the conclusions of that report, and I see people nodding and smiling, so this may be repetitious for some. It said that the comparison of cancer rates both before and after nuclear facilities began operation were especially informative. Overall, the relative risks of leukemia and other cancers appear to be slightly higher before reactor startup than after, providing no evidence that environmental pollution attributable to the facilities might be causing a substantial increase in cancer risk in the study counties.

| The committee concludes that the survey has produced no evidence than an excess occurrence of cancer has resulted from living near nuclear facilities, and so forth.

| Now, the State of Maryland has had in operation now for a number of years a so-called Cancer Registry. That is a much better indicator of cancer than looking at mortality data. The Cancer Registry records cases of cancer as they become diagnosed and the State Health Department has analyzed cancer incidence data for a five year period. Now this is unpublished data, but it is available.

| For a period of 1992 through 1996 -- now, let me say the Cancer Registry has only been in operation since that time -- they looked very specifically at certain geographic areas. They looked in a small area at two specific zip codes, 20657 and 20685, which are the Lusby Post Office areas and the St. Leonard Post Office areas. They looked at Calvert County as a whole. They looked at the three southern Maryland counties which make up Southern Maryland. They looked at the State of Maryland. And, of course, they compared that data with the country as a whole.

| They also looked at the incidence of cancer in children as compared with adults. Now, I heard concern raised particularly about children, and that makes sense because children, of course, are a better indicator for this particular situation, because if you look at adults, you are looking at a much more varied exposure possibility, with work place exposures, living in different parts of the country, but with children who have lived here, one can reasonably assume that their exposure has probably occurred in their place or residence, at least during the few years that they have been here as children.

| With children, they found that the incidence of all cancers in children during this study period was actually less in the zip codes that immediately surround the plant than in the state as a whole. They also teased out particularly the incidence of brain cancers and leukemia, since these have been associated particularly with exposure to radiation. These, again, showed no significant increase in incidence.

A32, They also looked at the incidence of cancer in adults, looking particularly at lung cancer, A.1.6 breast cancer, prostate cancer and colon-rectal cancer. Again, with the adult population, in all of these study areas, looking at the zip codes and looking at Calvert County, and Southern Maryland, there was no evidence of any increase in rates that is localized to those areas.

So that I think one can reasonably conclude, in a very objective fashion, that in terms of the effect on human health, as far as something that is specifically related to radiation, there is no discernible effect with respect to cancer which, of course, can be traced back to exposure to radiation. I also, of course, would have no reason to dispute the findings of the impact study that there is a small or no effect on human health across the board.

Thank you for your attention.

Mr. Cameron: Thank you very much, Dr. Rogers.

[Applause.]

Mr. Cameron: I am going to ask Captain Mogel to come up.

Mr. Mogel: My name is Russ Mogel, I am Area Director of the Maryland Charter Boat Association, a Calvert County resident, Chesapeake Beach. I have been running a boat on the bay for over 22 years. I talk to a lot of people, lot of my fellow captains and so forth. All they can say is they have seen improvements in our area since the plant has been here.

A33,
A.1.1

At night when the plant is lit up, it is like a light, bright beacon on the bay. It is really pretty. Sometimes you think it is a cruise ship coming up and down the bay if you look at it. So, just -- my basic comment is don't extinguish the beacon on the bay for us. Thank you.

[Applause.]

Mr. Cameron: Okay. Thanks, Captain Mogel. How about Gerald Clark?

Mr. Clark: Good afternoon, my name is Gerald Clark, and I am the President of the Solomons Island Business Association, and I am sitting here today, and I guess maybe I am one of the most unbiased people sitting in the room because I don't work for the government, I don't work for BG&E, I don't work for any association that has any agenda towards nuclear power or nuclear waste or any other thing.

All I can tell you is BG&E and the business community of Solomons have a marriage. We trust BG&E. But one thing we always want to do is verify, and these folks over here, their job is to verify what BG&E tells us. This report tells us what we already knew, these folks did it. Okay. We don't -- our agenda is to live here, have a good quality of life. We like BG&E, that is our lifeline.

A34,
A.1.1

Anything short of relicensing this plant, from what you have here, unless you can show me something else -- I am not an educated person, I am just a high school graduate, I don't have a big degree, I don't know all the technicalities, but I can tell you one thing, from what you got in here, there is nothing to say no to. I mean if there is something else you need to

| tell us, tell us, then we can deal with it. But we like BG&E. We want BG&E. Leave our
| power plant alone. Thank you.

| [Applause.]

| **Mr. Cameron:** Okay. Thanks, Mr. Clark. Angie Howard.

| **Ms. Howard:** I will be very brief and give a written statement. I am Angie Howard. I am
| with the Nuclear Energy Institute, and I also live just north of here in Anne Arundel County.

A35, Nuclear power represents 20 percent of the electricity in this county. It is the largest
A.1.1 emission-free source of power that we have available to today, and that we have to look
| forward to the future as we strive in this country, and in this state to meet our clean air
| goals, the future clean air goals, both from the standpoint of greenhouse gas emissions and
| carbon.

| My written statement talks about the public process that the NRC has put into place from
| the beginning and the development of a relicensing rule and the important role that the
| public throughout this county, as well as generically in the DC area, has provided to make
| this process better. Relicensing of nuclear plants is important to our country. While BG&E
| may be the first to go through the process, it is certainly not the last. There are quite a
| number of other plants that are moving forward in their planning processes. So it is
| important to, certainly, the State of Maryland, and in Calvert County, as we have heard
| today. It is important to our country. Thank you.

| **Mr. Cameron:** Thank you, Angie.

| Thomas Allhoff.

| **Mr. Allhoff:** Good afternoon. My name is Thomas Allhoff. I'm here today representing two
| organizations, the first being the Responsible Growth Alliance, which is a group of 30
| builders, developers, engineers, and suppliers who have served in Calvert County in excess
| of 30 years. The second group that I'll be speaking towards or for is SMBIA, Southern
| Maryland Building Industry. We will be speaking again this evening, if we can last through
| the presentation again.

| [Laughter.]

| As a point of reference, our members have had the opportunity to review the GEIS report.
| We have made numerous visits, site visits, to Calvert Cliffs. We visited both the reactor
| complex itself, the spent-fuel storage facility, and a number of members have also made a
| trip out to Nevada to look at the proposed site at Yucca Mountain.

On a personal note, my background prior to working with the building industry was 24 years with the United States Navy as a naval officer trained, certified, and ultimately qualified in using and working with nuclear materials.

I'm also a resident of Calvert County, having built three homes here. The first was in Chesapeake Beach. The second was in Huntingtown. The third, two years ago, being built in Saint Leonard, two miles from the Unit 1 reactor. So I'm getting closer to the powerplant than further away.

The building industry in Calvert County is a very unique industry when compared on a national level. The builders in Calvert County live here. We work here. We're part of the community, part of the organizations. We do not have a large influx of national builders, as many of our sister counties have.

Our businesses thrive in Calvert County because we're involved in Calvert County. BG&E has been a superb corporate neighbor. The GEIS draft report only confirms our feelings that BG&E has professionally addressed the way they work, the way they address environmental issues, as well as the technical issues associated with the proper maintenance and running of a nuclear powerplant.

We're builders. We're not nuclear scientists, we're not environmentalists, and we're probably not qualified to comment on the GEIS report other than to say that all the questions that have been addressed in the GEIS report appear to us to have been addressed properly and satisfactorily across the board.

As business people we serve on boards, commissions, committees, and panels throughout the year, and BG&E employees are invariably part of that working group. BG&E through its employees has demonstrated a very high degree of professionalism in every task undertaken. It is reasonable to us to assume that the professional thinking, logical actions, and thoughtful implementation outside of the plant are commonplace within the gated security of the plant.

The GEIS report addresses very specific environmental concerns. These concerns are there because of past experiences throughout our country. As we read and interpret the GEIS Calvert County -- Calvert Cliffs report, we believe that Calvert Cliffs has done an exceptional job in addressing all the issues associated with such a detailed review process. We also appreciate very much the open forum that the NRC has provided us. It is important that public comment be heard, but we would ask that you please give greater weight to the comments you hear from local groups and individual residents.

We are deeply concerned with those interlopers who have followed the ambulance call of nuclear relicensing into our county. They continue to refer to Calvert County as a possible nuclear waste dump. They continue to denigrate Calvert Cliffs and its people, not to mention the contributions to this county. We take great exception to that.

| We have seen the information on our Government's commitment to the nuclear industry,
| and we fully expect the Department of Energy and our Congress to fill their commitment to
| authorize a permanent repository for spent fuel. The housing industry as we fall under the
| socioeconomic category is very market-sensitive in Calvert County. In our case the buyers
| pretty much control everything. The biggest thing they control is site selection. They
| choose to come here. They know the powerplant's here. They choose to buy here.

| We have seen as an industry no decline in housing starts attributable to the presence of
| Calvert Cliffs, its maintenance, location, or its continued operation. To date we have had no
| lender, bank, or mortgage company express any reservations with Calvert Cliffs prior to
| their lending money for the purchase of buying new land or new housing. Rule of thumb, if
| the banks don't have a problem with it, you're doing something right.

| [Laughter.]

| The purchase of a sister reactor to perform real-time testing while the rest of the industry
| performs theoretical testing is just one reason we are so comfortable with BG&E. They
| have demonstrated a very proactive approach to nuclear power generation.

A36, A.1.1 | Calvert Cliffs has addressed environmental, technical, maintenance, facility, emergency
| response, and security concerns of the citizens of this county with prompt and professional
| responses. The nuclear issue is a complex one. The only way a community can feel at
| ease is if the operating company is professional, honest, and direct with the issues that
| arise through operation. BG&E has been all of these things and more. The industry as a
| whole is a good one. We just happen to feel that BG&E through its employees is better
| than the average power provider.

| There is no insurance against human error, but if you look at the 13 areas addressed by the
| GEIS report, they show a clear pattern of thoughtful and professional responses to
| environmental issues. There are no guarantees that things in the future will be as they have
| in the past, but the alternative power sources and the impact they would have on our county
| are far less desirable and more damaging to our environmental status.

| BG&E, its employees, and local NRC personnel continually go the extra mile to make
| Calvert Cliffs a safe, environmentally friendly, and sustainable asset to our community. We
| ask that you look favorably on the issuance of a license to continue plant operation within
| our county.

| As I stated before, we are local business people, and if we thought for a minute that the
| relicensing of Calvert Cliffs would do anything to diminish our business climate or our
| community in general, we would not be here today speaking in their behalf. Calvert Cliffs
| has demonstrated its ability to be an asset to this community, an asset we look forward to
| having around for a long time to come.

The only last comment I would make, not trying to be overly critical, is dealing with slide 41. You listed the addition of 60 new families as a negative impact on this county.

[Laughter.]

I would suggest to you, aside from us building our houses --

[Laughter.]

I would suggest to you that if these folks are of the same caliber and quality of the present Calvert Cliffs employees, they will be a definite asset and a positive addition to this community.

Thank you for the opportunity to comment.

[Applause.]

Mr. Cameron: Thank you, Mr. Allhoff.

Dr. Rockwell: I know you've been patient out there.

Dr. Rockwell: Like the previous speaker, but unlike a lot of people here, I guess, I'm one who pays his own way here. I'm not working for anybody else.

I'm representing the American Nuclear Society, and I have a written statement which was prepared by the American Nuclear Society which I want to put into the record, and I won't try to read it to you. But it concerns the environmental --

Mr. Cameron: We'll make sure all these statements get into the record, so please provide us with them.

Dr. Rockwell: There are some more copies of that in the back, if you like.

Mr. Cameron: Okay. Thank you.

Dr. Rockwell: But I just want to urge a couple of things. One, when we talk about the danger to life and health, first of all, you have to look at the facts, as Dr. Rogers, was it, just gave us. The idea that somebody down the road isn't feeling well and the doctor doesn't know what's the matter with her, and so therefore it must be the nuclear plant, is not a very good way to judge hazards. And when you go in and you have these health departments who have no interest in the nuclear industry but are only interested in protecting the health of the citizens, and they do an analysis of what the situation is, that's something you can depend on.

A37,
A.1.6

| If you don't want to depend on that, then just look at the record. You worry about how often
| a meltdown is going to occur. We've had over 100 nuclear powerplants operating in this
| country, some of them more than 40 years. In addition to that there are 220 nuclear
| powerplants that have been built by the Navy and operated by sailors, and in all of these
| cases, nobody has ever been hurt. A whole generation, 40 years, and nobody has ever
| been hurt.

| We've got people, just this last couple of weeks we've seen a solar plant explode, they had
| the hot fluid, organic fluid with the heat transfer, blew up, we've seen gas plants explode,
| we've seen fire from oil -- these are real people getting killed by real accidents, and yet you
| look at the story, nuclear waste, this dreadful problem of nuclear waste. Nobody has ever
| been hurt by nuclear waste, and nobody ever will.

| The only difference between a radioactive toxin and a nonradioactive toxin is that a
| radioactive toxin slowly dies out and becomes less toxic. But if you take the toxins like
| bromine and -- look in your vitamin pills, for instance, and you'll see in your vitamin pills
| there is boron, there is manganese, there is even selenium. These things are in there
| because small quantities of these are essential to human life. And the same thing is true of
| radiation. Experiments have been done in which the natural radioactivity of the body, which
| is mostly from natural potassium, has been removed from mice, and they've been fed
| isotopically controlled potassium. They get sick and die.

| It would be anomalous and it would be astonishing if nuclear radiation did not act the same
| way as all other toxins, because what they do in small quantities is that they stimulate the
| body's defenses, and it's like any other thing, whether you're talking about a influence shot
| or anything else, small quantities stimulate the body's defenses. There's a study on that, a
| national study that's going to be out this fall. It's already been done with every kind of toxin
| you can think of, and it's now specifically looking at radiation and finding that it's following
| the same line, which you'd expect.

| But the point I want to make is that we know what happens when a nuclear reactor melts
| down. It happened at Three Mile Island. And we did get the initiation of the China
| Syndrome, tons of molten fuel slumped to the bottom of the reactor, sat there, and that's
| supposed to be the start of the China Syndrome. My company went in, sampled the
| pressure vessel to see how deep it had penetrated, how far toward China it had
| progressed -- a small fraction of an inch.

| So we know -- so that when someone makes a statement about a location 40 miles away
| being endangered by a nuclear accident, that's an irresponsible statement. There is no way
| you could make that happen. If you paid people to do it, you couldn't produce that kind of
| an effect.

So I just urge that when you look at these things, you fall back. When people talk about nuclear waste being the big hazard, who's been hurt? Nobody. How could they be hurt? I urge you not to go out and eat nuclear waste, but other than that --

[Laughter.]

You're not going to get hurt. It's as simple as that.

[Applause.]

Mr. Cameron: I guess that's the tip of the day, right, don't go out and eat nuclear waste.

[Laughter.]

Donald Graf.

Mr. Graf: I'm Donald Graf, and I'm a resident of Calvert County. And after some of the other speakers we've had up here today and how they spoke, it would be anything -- to attempt that would be really silly on my part, but I do want to speak as a resident.

I've been a resident here for many years, and I intend to live out the rest of my years in retirement here. I boat on the bay, I go down to the water, my grandchildren are here, and I feel very, very comfortable about what they're doing. I'm also very concerned about the environment, just as an individual. Nobody else. And I live here.

I want to thank you for the opportunity to be able to talk about matters of this nature. I've read the report. I've read it pretty thoroughly. And I'm pretty impressed as an individual about the depth and the thoroughness of which these people have gone to determine safety for us that live here. Therefore, I feel very confident in accepting their conclusions and thoroughly feel safe in the extension of the license of this plant.

I think we must have adequate power to maintain our lifestyle, because this addresses the alternative. Nuclear is clearly the most clean way of doing it, and frankly I don't know how we as a country can possibly meet the environmental release promises that were made by this country if we don't continue nuclear power. I also look at the global warming effects, and don't have any idea how we can keep the power in our way of life unless we keep nuclear power around.

I also do take some umbrage with outsiders who come into our community and to propose furthering their own misguided agenda, because I really believe it is misguided. I respect the right of everyone to speak. Free speech in this country is pretty important. But I don't believe that right to abuse that right by taking on other agendas should take our time here this afternoon.

| Now we have 20 years of experience in the operation of this plant. This is not just a "what
| if" or theoretical discussion, but we've heard an awful lot today of the data that has been
| generated through this 20 years of life of a plant, and I see no reason to expect our very
| satisfactory experience has any reason to change. So I as a citizen truly ask you and
| request that you give approval to this application for extension for 20 years. And thank you
| again for your time, sir.

| **Mr. Cameron:** Thank you.

| [Applause.]

| How about Carolyn. Carolyn McHugh.

| **Ms. McHugh:** I'd like to thank the NRC for having the public meeting. I am Carolyn
| McHugh. I'm the executive director of the Calvert County Chamber of Commerce. I am
| here today to speak to a very specific area of our environment, and that's the economic
| environment of Calvert County.

| I'm here today to speak on behalf of nearly 3,000 businesses in Calvert. The nuclear
| powerplant is just one of those businesses, but it's an important business. There are very
| few large employers in the tri-county area, and specifically in Calvert. And of the 3,000
| businesses in Calvert, only 1,500 of them employ less than five employees. They're not
| small businesses, folks, these are microbusinesses. And they all depend in some degree
| on the nuclear powerplant.

| BG&E contracts locally for many of the services that it uses to operate its daily operations.
| On any given day, local businesses are contracted for rental of equipment, for temporary
| staffing services, carpentry, electricians, plumbers, architectural engineering services, fire
| suppression systems, landscaping, snow removal, underground piping systems, for well
| water and for sewer systems, for roofing repair, for roofing replacement, and for HVAC
| systems.

| BG&E doesn't just stop at considering local businesses for contracts. Its procurement
| officers go out actively into our business community and give seminars to local businesses
| on how to get on the vendors list. Last year BG&E contracted for an estimated 1 to 2 million
| dollars of local businesses and contracts in the tri-county area.

| Now that's the contracting dollar side of the equation. There's another. You've heard that
| BG&E is the largest private employer in southern Maryland, that it employs 1,500
| employees, and that over 1,100 of those live in Calvert County and that they bring \$59
| million of wages to our county.

Now it's easy to paint with a broad brush and say that those payroll dollars stay locally, and in some way affect virtually every business in Calvert, and it does. But the significance of how those wages impact local businesses and other organizations becomes much more apparent and much more personal if you consider what I refer to as the flight of the BG&E dollar.

Consider if you will this small scenario. BG&E pays an employee. The employee deposits that check in a local bank. Later the employee withdraws the money to buy produce at a local farm stand. The farmer pays his local co-op bill. The electric co-op pays an Internet provider. The Internet provider buys a dinner someplace. The restaurant owner pays an accountant, and the accountant buys flowers for his wife for an anniversary. The florist pays an attorney. And on Sunday, the attorney drops money into a local collection plate at a church. On Monday, the church puts the money back in a bank. Our attorneys and our Chamber of Commerce do.

[Laughter.]

And the cycle begins again.

Now that scenario may have made you laugh and it may have brought to mind the nursery rhyme that makes us all smile as children -- the butcher, the baker, and the candlestick maker. But I can assure you, ladies and gentlemen, that if Calvert County, the smallest county in Maryland, loses 1 to 2 million dollars in contracting dollars, if it loses \$59 million in employment wages, then the citizens and the businesses in this county will not be smiling. Calvert Cliffs is a good neighbor for everyone in Calvert. To the businesses it's more than that, it's a lifeline. On behalf of all those businesses, I urge you to grant the relicensing request of Calvert Cliffs.

A39,
A.1.1

Thank you for your time.

Mr. Cameron: I am trying to get to the people -- we have a few more to go. I am sorry we are running late but we are going to stay so that we can hear all of you, trying to go to the people who have not spoken as of yet, but we have other people signed up.

Let's break the chain a little bit here and go to Jim Riccio. Jim?

Mr. Riccio: Thanks, Chip. Again, I am Jim Riccio. I am the staff attorney with Public Citizen, and I guess I am the interloper you all are referring to.

If you take a look at page 2-42 it has a nice little map of the area and an outlay of basically what is known as the -- I used to know it as the plume exposure pathway. Basically it is the pathway that you could possibly ingest radionuclides in the event of an accident.

A40, A.1.3 | If you notice, that includes Washington. so if I am an interloper, I am a little far from home, I still have concerns about this reactor. What I have more concerns about is the fact that the process the NRC has set up is illegitimate. They had a substantive review process, but that resulted in the shutting down of a nuclear power plant and the industry found that to be unacceptable. They had too much invested in this reactor and too much invested in your communities to see someone like the NRC take that away.

| Now when I was here about six months ago I said that the only green issues that were being dealt with here were dollar bills, and again that seems to be the case. What I came here today to address were the severe accident mitigation alternatives, the ways you can make this reactor safer.

| Unfortunately I have been informed that we are not going to address all of those under this renewal process. We are going to wait until period down the road to address these alternatives, basically things like making sure that your batteries are up to snuff.

A41, A.1.10 | Now you all had Daylight Savings Time here a few days ago, and the fire departments always take that opportunity to remind you to change the batteries in your smoke detectors. Well, one of the things that this report, which is pretty substantive, talks about, is enhancing the batteries at the nuclear power plant -- something a little bit more important than your smoke detector.

| They are not going to do that now. They are going to say because it doesn't have to do with aging -- now they also said there may not be better batteries out there. I can't believe that is the case.

| There was a process. The process has been neutered by the nuclear industry and so basically a lot of the safety issues that were addressed up at Yankee Rowe in Massachusetts aren't being addressed down here. I don't think that is appropriate. I don't think it is right.

A42, A.1.10 | I don't think the fact that there are other safety alternatives that aren't being addressed in this report until further down the road -- I don't think that is right either. While it is important for you all to know that obviously BG&E pays a lot of your salaries and provides a very high standard of living for the people of this country, but an accident is possible and to ignore those risks is irresponsible. I would hope that in the future and further down the road I can work with the people at NRC to ensure that those risks that aren't being addressed in this document are addressed before this reactor operates much further.

| One thing you should acknowledge too is that at some point this reactor will shut down and you are going to have to find other jobs and other ways of making a living and turning a profit here.

This county existed long before Calvert Cliffs was splitting atoms and it is going to exist long after it does, hopefully, and so as responsible individuals in your community, look down the road and realize that at some point this reactor will shut down and that you are going to have to make some tough business decisions, and so start moving towards that now because even though they are extending the license 20 years, no reactor has operated for 40 years in the United States. None.

More reactors are shutting down than are being relicensed, and so to look into your future and say that you can expect the largesse of BG&E to support this county is short-sighted.

Now you can call us environmentalists and you can say that we are interlopers but we do that because we have a belief that you are not being told the truth here, and that is not just based on hearsay. I wrote a report on that rule back in '94. I was going to intervene in the process. As a matter of fact I have been catching grief from the press that I am not intervening in the process. The reason I am not intervening in the process is because the process is a farce. It is a rubber stamp and unfortunately it does a disservice to the people at BG&E, who put a lot of effort in, because their plant may have been able to get through the original process.

It may have been able to prove that it should operate beyond its license life, but unfortunately NRC is not making that determination. They are saying it has operated so far -- it will operate into the future -- don't worry about it.

The people of Chernobyl probably thought the same thing. Up until the day they melted the reactor down or I guess they exploded it as well, they felt their level of safety was adequate. It turned out not to be. After 28 shuttle flights NASA thought that their level of safety was adequate. It turned out not to be.

After twenty-something years of operation here at Calvert Cliffs, BG&E and the NRC think that the level of safety here is adequate. It may not be and there are at least a few things in this report that you can do to improve the safety of this reactor and since they are going to be dipping into your pockets for millions of dollars for stranded cost recovery, the least they can do is make a few safety improvements at this plant.

Thank you for your time and your consideration of my comments.

[Applause.]

Mr. Cameron: Thank you. How about David Jenkins?

Mr. Jenkins: Good afternoon and thank you. For the record my name is David Jenkins. I am the Executive Director of the Tri-County Council for Southern Maryland. We are the regional planning agency for St. Mary's, Calvert, and Charles County. Our membership consists of all the elected officials of Southern Maryland. That is, all the County

Commissioners, our House of Delegate members, and our State Senators. That is 29 members.

I am here to support on behalf of the Council the licensing effort for BG&E at Calvert Cliffs. Our agency was created by state law in 1963 and we are responsible for a variety of aspects in Southern Maryland regarding environmental planning, transportation planning and we are also involved with the regional economic development activity here in Southern Maryland.

I won't go through what some previous speakers have indicated regarding BG&E's employees, their payroll and their contribution to the area, but I would be remiss if not saying that they have contributed very greatly to the Southern Maryland region as well as to the Tri-County Council by the contribution of John Smith and Jim Lamons have been very instrumental in working with the Council over a number of years.

A44, A.1.1 The importance of this facility with respect to both the environmental aspects as well as the economic aspects has been recognized in the Council's draft plan for the future growth and development of Southern Maryland that was issued in draft form in this very room in December of 1998. It has been recognized that the plant along with its employees of engineers and other technicians have contributed greatly to the economic engine here in Southern Maryland and probably we will continue to do so in the future and will allow additional technology transfer to other opportunities here in Southern Maryland.

Again I want to re-emphasize the corporate contributions that BG&E has made to Southern Maryland. I live in Charles County and I have a lot of neighbors who work here at the plant itself and on a personal note in my previous experience in a previous life I had the experience to work on various environmental projects and am somewhat familiar with the NEPA process.

Having reviewed the draft document and knowing the complexity of this facility and how it has operated over the years, it is in my opinion a very thorough job of analyzing and identifying the issues that need to be addressed, so I would applaud the NRC and BG&E for doing that.

So in conclusion, again we want to offer our support for the effort to renew this license. Thank you for the opportunity to be here tonight. Thank you.

Mr. Cameron: Thanks, David.

[Applause.]

Mr. Cameron: Paul Gunter.

Mr. Gunter: Thank you. My name is Paul Gunter. I am Director of the Reactor Watchdog Project with Nuclear Information and Resource Service in Washington, D.C. I have been involved with this issue for about 25 years, originally started over at Seabrook, New Hampshire, where we saw an NRC licensing process basically roll over a community vote to stop a construction project of the Seabrook Nuclear Power Station, so I believe the door obviously does swing both ways, and certainly I am here to also say that I am proud to be an agent for communities that refuse to receive nuclear waste from facilities like yours.

We were active in stopping the opening of the Sierra Blanca, Texas nuclear low level radioactive waste site, predominantly a Hispanic community, \$7000 annual income per capita. It also happened to be located over an earthquake fault which both industry and NRC and a large degree of Texas government continued to overlook, but eventually these issues prevailed and the Sierra Blanca site was not opened, and I am happy to say that the same trend is working along the lines in Ward Valley, California, another site that -- a would-be recipient of radioactive waste generated at nuclear power stations.

I am also proud to say that we do work with communities that are concerned about the tracking of dry casks that store high level radioactive waste, and it is a concern of ours that there is a degradation on site storage of high level radioactive waste.

We also work with the citizens of Nevada to stop the transport and burial of 70,000 metric tons of irradiated fuel generated at facilities like Calvert Cliffs at a site that has 28 earthquake faults and some of the youngest volcanos in North America and these are all part of our agenda to stop the mismanagement of high level radioactive waste and low level radioactive waste, and certainly it is part of our agenda also that the first responsible in dealing with the radioactive waste problem is to put a cap on the amount that is being generated and mismanaged and to put a cap not only on the volume but the curie count that will remain a persistent toxin in this environment long after jobs are lost, long after one watt of electricity is no longer received from these facilities, but the entire liability of radioactive waste generation will be passed along to a society that will receive absolutely no benefit.

But what I am really here to talk about is the concerns with this whole process and that the NRC has determined this whole issue of no new information as a way of cancelling out issues to be dealt with in license renewal and I think is it absolutely absurd and irresponsible that I have to stand here and say that this agency has taken off the table the issue of continued generation of high level radioactive waste with a policy that has been bankrupt for 50 years in terms of shuttling the waste around within the fuel pools, exceeding design capacities now four or five times in some sites, shuttling it off into dry casks that have 20 year license periods for waste that will persist for millions of years in geological spans of time simply to continue operation, and this licensing process that we are facing right now we believe to be an environmental justice issue.

That is why we come to your community. It is not to basically just to address the issues of your plant but that the operation and continued operation of this facility will not only impact

| communities outside of your own special interest but will persist into an environment that
| spans geological time, and I think for us not to deal with those issues here and now is
| absolutely irresponsible.

A47, The other thing is that the routine operation of the Calvert Cliffs by NRC documentation has
A.1.5 put about 150,000 curies of radiation into the environment. Now that may seem like an
| insignificant and small number, but I think that what I want to close on is that routine
| omissions with bioaccumulation, biomagnification, persistent toxin and no safe threshold for
| radiation -- now this is an obvious topic of controversy but I think the challenge that NRC
| has is to produce the studies that show safe thresholds and to produce those in and include
| them in the GEIS.

A48, You know, it's like that would be a measure of showing your confidence in the continued
A.1.6 operation and the continued release of these persistent toxins is something that can be
| permitted and allowed, but in fact to counter some of the earlier issues, there are studies
| that show that routine emissions, chronic low dose exposure has a deleterious effect and
| you can go to the Massachusetts Department of Public Health, which has no agenda, no
| anti-nuclear agenda, but by their own published study in October of 1990 it showed a 400
| percent increase in adult leukemia and they, the MDPH, directly attributed that increase to
| both the duration that the resident was to the Pilgrim Nuclear Power Station and five
| contiguous communities in a 25-community study area, but both their duration and their
| proximity, so there are studies both sides, but I think that that produces enough evidence to
| show that it should be a Category 2 issue and not shuffled off into this category where it will
| not be addressed in the proceeding. Thanks.

| [Applause.]

| **Mr. Cameron:** Thank you, Paul. Christopher Reynolds -- we finally got you up there.

| **Mr. Reynolds:** The grouch.

| **Mr. Cameron:** The grouch is here -- and we just have a couple more including Barth
| Doroshuk from BG&E. I'm sorry, go ahead, Chris.

| **Mr. Reynolds:** That's all right. I will try to keep it very short. I don't want to repeat the
| comments that were made before.

| My name is Chris Reynolds. I am a resident of Calvert County, as I told you before. I am
| an attorney here and I am also Chairman of the Economic Development Commission here
| in Calvert County and Vice President and a member of the Board of Directors of the
| Chamber of Commerce -- so I am coming at this thing in a number of different ways. Let
| me just -- from a standpoint of being an individual resident of this county, with all respect to
| you, Mr. Riccio, you do have a vested interest. This is 40 mile away neighbor of mine. My

back yard is two miles and that doesn't mean I have a greater right to speak about this thing, but I do have a concern, a direct interest.

I can tell you I have read this report and I read it as carefully as I could. I am not a scientist and I can't tell you, I can't draw the conclusions as an expert that have been drawn in this report, but I will tell you that I think it is quite inclusive, it is exhaustive and I can tell you I sit out in my back yard and I watch the osprey and I see with some frequency bald eagles. I fish those waters by the plant. I eat the blue crab. God willing, I am still alive here.

What I see and what I taste and what I feel tells me that BG&E is a good neighbor and I think they deserve relicensing. A49, A.1.1

As a representative of the business community, I can tell you that BG&E, as you have heard before, provides sustenance to this county. We rely on it. We need it and in addition to being a good economic partner with the county their employees and representative do participate in a wide variety of local institutions, fraternal and other, civic, and like organizations. They are really a partner and a good partner and a good neighbor and we want them here for another 20 years after 2013 and 2016.

Let me just address a couple of points, and first of all, I want to say this is a welcoming community. Calvert County is a wonderful, wonderful place. We are delighted to have you all here and we are delighted to have you all here too, and I do appreciate the depth of your feeling and the intelligence and emphasis that you bring to the process. I think it is good. We don't have to agree with it, but we think it is good.

I don't want you to think you are interlopers, okay? We welcome your comments. We are welcoming. We are an open community, so don't feel that you are not welcome here, but there are a couple of things I did want to address what you, Mr. Riccio, said, and then I'll leave, okay?

First, you said that we have to prepare for the plant's shutdown, and you are right. There is no question about it. Because of the economic constraints that this county is facing now, it is the fastest growing county in the state of Maryland with the lowest economic and commercial tax base, and we literally -- I can't say we will go belly-up -- but things are going to be mighty tough without Calvert Cliffs.

By the same token I don't want you to think that we are just interested in getting the green, the dollars, okay? Yes, I am worried about my health and I am worried about the health of my wife and my child and even my dog -- these things concern me. I have a feeling of trust. I think this report is quite inclusive and there may be some other issues that are addressed in another context but I have good faith that my good neighbor, BG&E, is looking after us, and I think the NRC is doing a very, very good job and affiliated organizations with studying all of the issues that affect our lives, economic and existence.

| The final point I would like to make is this. You pointed to two tragic circumstances,
| Chernobyl was one and the space shuttle disaster was another and there is not question
| about those being terrible incidents and should all give us pause, but life is a risk and as
| soon as our feet hit the ground when we get out of bed it's a risk.

| Lindbergh -- what would happen if he said I don't know that I can make it, so he didn't go?
| What if John Glenn says I am afraid I won't get back, I better not go? And just to bring it
| maybe even to a more ridiculous level, what if Mark McGwire said, well, the hell with it, I am
| never going to break Babe Ruth's record -- but he did it. We have to take some risks. They
| have to be measured. We have to assess our chances, but risk is a part of life.

| Thank you all very much.

| **Mr. Cameron:** Thank you, Mr. Reynolds. Thank you. David. Dave, did you want to say
| anything more? Robin, do you want to say something up here?

| **Mr. Mills:** Hi, my name is Robin Mills. How are you today? I am Director, recently -- just
| became recently Director of the Maryland Safe Energy Coalition, and we are very
| concerned and involved in this process.

| I would like to ask everybody here if you would work with me to conduct a small experiment.
| Can I ask everybody in the room to please stand up, please? Just -- it will be easy to do.
| Just please stand up, just for a minute.

| Now, I wanted to ask those people who work for the government, including NRC, to please
| have a seat. And those people who work for BG&E or subcontractors of BG&E to please
| have a seat. And those people who work for state and local government agencies to please
| have a seat. I wanted to see who was remaining standing, obviously. So I see that we
| have quite a few people from professional agencies, professional nuclear organizations.
| Can I ask the members of the professional nuclear organizations to please have a seat,
| including NEARS and the American Nuclear Society and NEI?

| Who do we have left? Is this the public? I guess so. Thank you very much. That was very
| brief. We had six people standing at the end.

A50, Risk is the point here. Certainly, this county would benefit a lot from having this contract
A.1.2, extended for 20 years. The question is, how do we assess what the risk of those additional
A.1.10 20 years is, and is that additional risk worth the benefits? It is a value judgment.

| There is a percentage chance that there will be a severe accident, a very small percentage.
| And the benefits, we know a little bit more about the benefits. The benefits are going to be
| pretty big, the jobs, the income, the tax base. And so it is a value judgment as to what the
| risks and the benefits are.

On page 5-3 of this document, I tried to point out earlier that BG&E tried to assess what the risk of a severe accident would be. And I would like to go through those figures just to make sure you all understand what the risk is of a severe accident. And these are BG&E's figures on 5-3. They say 3.3 times 10 to the minus 4th, core damage per reactor year, now that equals .00033, which is 33 per 100,000, which is 1 in 3,000, for 20 years, we multiply it by 20 years. For two reactors, that means 1 chance in 75. That is 1.3 percent chance that there will be a severe accident that will damage the core. I want you to understand that that is the risk, that 1 chance in 75 over those 20 years that there will be a severe accident.

That is not a huge risk. But we have to understand that despite Dr. Theodore Rockwell's statement that no one has ever been hurt, that, in fact, Chernobyl did hurt a lot of people, and it is still hurting people throughout Ukraine, Bellarus, even Lapland. That hurt a lot of people. And the risk of a major accident does exist, it is not insignificant. So I think we have to face that possibility and make value judgments.

In reducing that risk, BG&E has proposed on page 5-24 to replace a water-tight door. I think that is inadequate. I think there are other things that could be done and should be done to reduce that risk. This is an experiment, just like the experiment I had where I asked you all to rise. This plant will operate longer than any nuclear plant has ever operated anywhere on this planet, period. Sixty years is more than any plant has ever operated. So it is an experiment, this would be a first of its kind. We don't exactly know all the mechanisms of what will happen.

A51,
A.1.10

I would like to talk to you just a bit about some study I have done on what the potential is for an accident. This is an authoritative text, "Nuclear Reactor Engineering, Reactor Design Basics," by Samuel Glastone and Alexander Sozanski, 1994, a very authoritative text, and they talk about the structural changes caused by neutron interactions, in other words, neutron embrittlement.

A52,
A.1.12

Now, I keep looking through here, looking for them studying neutron embrittlement. I don't see a whole lot, and I tried to bring it up as questions. But the bottom line is that collisions by neutrons cause displacement inside the metal lattice. The metal is like a crystal and the neutrons zipping in there from the reactor cause atoms to be knocked out of place, making the metal brittle, because it has structural flaws inside the metal.

And these authors understand that. They say there is the possibility that accident sequences leading to the injection of emergency coolant water would result in combinations of vessel temperatures with thermal and pressure stresses that could lead to catastrophic vessel fracture. In other words, the reactor pressure vessel could crack and fall apart and there would be no way to cool the core. And these authoritative authors recognize this as a realistic possibility.

It is small, it is a very small chance that it might happen, but the chance that this might happen increases every year the reactor operates, because there are more defects in the

| metal from neutron embrittlement. The temperature at which this happens increases year
| by year due to defects in the metal.

| He goes on to say, the feasibility of the lifetime extensive may indeed depend upon the
| non-ductile transition temperature margin available. So, these authoritative authors
| recognize this as being a critical point in license extension. Yet, as I look through here, I
| don't see this as being a major point. Authors in textbooks see it as a major point. Why
| does not this become a major point in this Environmental Impact Statement?

| I think the risk of a severe accident is one of the most severe consequences, environmental
| consequences, that could occur, and I would like to see something done about it. I receive
| stuff from the Nuclear Regulatory Commission and I received this recently. It says down
| here, more than one-third of the broken wires were shown to have brittle fractures. This is
| the vertical tendons inside the reactor building, containment building. One-third of the
| broken wires were shown to have brittle fractures. This is not expected, this is something
| unexpected that is occurring inside Calvert Cliffs Nuclear Power Plant right now and it is
| metal that has become brittle.

A53, I could go on and on and on about this stuff. But we just did an experiment -- or, actually,
A.1.11 PECO just did an experiment, I am a stockholder at PECO, and they did an experiment at
| Peach Bottom with Y2K. They turned the clocks forward to find out what would happen,
| and all the computers crashed for seven hours. There were articles in the New York Times
| and the Baltimore Sun and other places.

| If power should fail and backup power fails, it is a serious problem because the core can't
| be cooled, pumps don't operate. Cooling water is not sent to the spent fuel, so the water
| boils off and the fuel melts, and disasters happen. Nuclear reactors need a consistent
| source of power, and in a Y2K disaster situation or other possibilities, there is the possibility
| of an accident.

| Jim talked about TMI, Chernobyl, Challenger, all these accidents were said to be
| impossible. They said one in a million before TMI. Now, they are talking about what, one in
| a hundred? Before Challenger, one in a 100,000, now it is one in 40, one in a hundred.

| **Mr. Cameron:** Robin, I am going to have to ask you to --

| **Mr. Mills:** Okay. Well, I will write this down and I hope you read my comments. I can't
| afford full page comments like BG&E can, but I went to a lot of expense and time and
| trouble to be here today, and I would like to invite any local residents here to eat dinner with
| me this evening and talk about it over dinner.

| **Mr. Cameron:** But no nuclear wastes, right?

[Applause.]

Mr. Cameron: I am going to do an experiment. How many people would like to stay here to 7:00 and join the 7:00 meeting? That's a joke. Sorry.

We have two more people, Kay Dellinger and then we are going to go to Barth Doroshuk, and then we are done.

Ms. Dellinger: My name is Kay Dellinger, I am the Legislative Coordinator of the Maryland Safe Energy Coalition. Nuclear power, like nuclear weapons, is inherently evil. It is evil from the beginning to the end. It begins in uranium mines, and uranium mining leaves mine tailings on the land and they get in the groundwater, and they give horrible cancers to the miners and their families, including children. And the end is nuclear waste in huge amounts that remains radioactive and, therefore, dangerous to every form of life for hundreds of thousands of years. There is no safe way of disposing of this waste and no safe place to put it, and no safe way of transporting it.

The terrible dangers of nuclear power from the beginning to the end make it completely unsuitable for a society to use to produce energy. The uranium miners who die from cancer are people of color, primarily Native Americans and these Native Americans are poor and powerless, and they are nameless and faceless, and they die without anyone in this country knowing or caring. Native Americans revere nature and understand that the earth is our mother and it is the earth that gives life to all of us.

Human beings can never conquer nature. Human beings are simply part of nature. We have become the most destructive species that has ever been on this planet. We have caused tens of thousands of other life forms to become extinct and extinct is forever. The majority of our species has the absurd belief that human beings are superior to the other species on this earth. In fact, we are not superior to any species and our destructiveness makes us inferior to other species.

Using nuclear power for energy is destructive and it is unnecessary. This country can do the research and development needed to produce efficient solar energy, wind power and geothermal power. It can invest in conservation techniques and deploy them. Nuclear power plants are unsafe and can have a major accident such as Three Mile Island had, and this year is the 20th anniversary of Three Mile Island, and such as Chernobyl had at any time.

The operating license for Calvert Cliffs should not be extended and the Nuclear Regulatory Commission should immediately develop a process to deny license extensions to nuclear power plants. How can any license extension be denied if there is no process in place to deny an extension?

The Nuclear Regulatory Commission has given us here the form of a public process without the substance of a public process. The NRC needs to immediately put into effect a process to deny extensions of nuclear power plants. Our country already has tons of nuclear waste from the military and from commercial use, and it has no safe place to put this radioactive waste.

The federal government just started putting military nuclear waste in the waste isolation pilot plant in New Mexico, even though New Mexico has not given the United States a permit to do it. So much for states' rights. It is a salt mine in New Mexico where they are putting this waste, and if the federal government fills up the whole salt mine in New Mexico with its nuclear waste, that salt mine will only hold 2 percent of the military waste. There will still be 98 percent left with no place to put it.

The military and commercial use and production of nuclear weapons and nuclear power must be permanently stopped. It should be stopped beginning here and now by denying Calvert Cliffs an extension on its license. Calvert Cliffs must stop producing nuclear power. The NRC must make it stop now.

Mr. Cameron: Okay. Thank you. We are going to our last speaker, Barth Doroshuk from BG&E. Barth

Mr. Doroshuk: Well, good afternoon -- or good evening. My name is Barth Doroshuk, and I am the Director of the Life Cycle Management Project at Calvert Cliffs and I will bet you are wondering what I am going to say. I am here to represent the Baltimore Gas & Electric Company at the United States Nuclear Regulatory Commission meetings and the purpose of these meetings is for the NRC to offer the public another opportunity to participate in the relicensing process at Calvert Cliffs.

As we have heard, this particular opportunity is to provide the NRC with any comments on the Supplement Environmental Impact Statement for Calvert Cliffs. On behalf of BGE and the Calvert Cliffs family of approximately 2,000 men and women who work at the plant, let me express my thanks for the opportunity to make a statement regarding the environmental impact of license renewal for Calvert Cliffs Nuclear Power Plant.

Today I would like to discuss two subjects with you, and then I will yield my remaining time to the other speaker for BGE. First, I would like to discuss the openness of the overall relicensing process, and, in particular, that of Calvert Cliffs. And, secondly, I would like -- the second subject I would like to discuss are the findings of the U.S. Nuclear Regulatory Commission regarding the environmental effects of relicensing. And, finally, I have arranged for Calvert Cliffs to make a few statements on its own on behalf of itself relative to the surrounding environment -- we have gimmicks, too -- and its role in Maryland and as a part of the BGE family.

There has been some interest today expressed in the public process of the relicensing of nuclear power plants. Let me briefly describe how open the environmental review has been, how many opportunities there have been for public input. I want to do this by looking at the openness of the overall regulatory process and how open our minds have been, about relicensing, to everyone. Then I want to look at how open our door has been to everyone and tell you about some of the people who have taken advantage of that open door policy. And, finally, I will let you know, or I will at least make you aware of our ongoing open invitation to address your ideas, your questions, your concerns, or your suggestions.

A58,
A.1.3

Before our application was submitted, the NRC conducted a five year public proceeding to prepare the Generic Environmental Impact Statement on License Renewal. The proceeding included public workshops, several opportunities throughout those years to submit written comments on the draft analysis that made up the GEIS, and, finally, a formal rulemaking.

Then, in our proceeding, the NRC has conducted scoping meetings, prepared a draft supplement looking at the site-specific impacts of renewing the Calvert Cliffs licenses. The NRC staff has looked at all the issues that were generically resolved in the GEIS. They have determined that they remain valid for the Calvert Cliffs plant, and, in addition, the staff has looked at the issues that were not resolved in the GEIS and also found that any impacts associated with these issues are small.

The public now only has the opportunity to express its views today, as we have heard, but also the opportunity to submit another round of written comments to the NRC on the Supplemental Environmental Impact Statement for Calvert Cliffs.

In July of last year, and as we heard today, many of us met in the same location to express our opinions and to submit our comments about what the scope of the environmental review should be that would occur as part of the review of our license renewal application. This process has been much more than writing letters. The NRC listened to our comments, to our ideas and our suggestions. They even enlisted the assistance of a national laboratory to help them review all of the information. As a result of comments made, the scope of the review was expanded. We have an open mind in this process.

Looking closer to home, here in Calvert County, since 1993, BGE has held in excess of 60 public meetings either here in Solomons, at the plant in Lusby or in Rockville, Maryland at NRC headquarters. And in the last 12 months we have held no less than 14 of those public meetings on the topic of license renewal.

We, additionally, have submitted literally hundreds of documents that detailed our process. In fact, 98 percent of our application was on the public record for over a full year prior to the formal submittal, and we had requested the NRC to begin their review in a public nature, holding public comments. It wasn't a 30 day shot in the dark for the public.

Apart from the license renewal process, Calvert Cliffs has a visitors center that is open seven days a week. The Calvert Cliffs family hosts, on average, 3,000 people per month who come to visit us. These visits allow for learning by our visitors and for listening by us. In addition, there is an open invitation to request a tour of the actual plant seven days a week, inside the fence, inside the buildings. Every year we conduct 100 to 150 tours ranging from private citizens from Idaho who are touring Southern Maryland, to Boy Scout troops, to formal agencies, companies, and, yes, even the public action groups, without hesitation.

Mr. Doroshuk: The message here is if anyone, anyone, whether you work for BGE, whether you work for a government agency, whether you work for the nuclear industry, whether you work for a public action group, if any of you have a nuclear safety concern or any information at any time that indicates the environment is being disturbed, there is virtually an unlimited number of avenues to get that information to BGE, to the NRC, to the State of Maryland, to the State Police, to whoever the right people are. You can dial a toll-free number, you can e-mail us, or you can simply stop by.

I think the process that we're under -- going through has offered an enormous amount of opportunity, not just because of license renewal, but on a daily basis, seven days a week. It's been open, our minds have been open, our doors are open, and there continues to be an open invitation for all of you, no matter who you work for, no matter where you live.

Those of you who were here last July heard me discuss the conclusions of BGE's own environment review and some of the facts surrounding or decision to submit our applications, some of the facts that supported our conclusion that it makes good sense to continue to operate the plant. After all the scientific studies that we have conducted, that you've seen have been conducted, and I'm impressed with the breadth of it all, and after taking into account all of the considerations and all of the alternative actions, we continue to believe that it makes good sense to maintain the balance and the equilibrium established between the plant, the air, the Bay and the land.

I would draw everybody's attention to the table that everybody wants to go to. I believe it says it all. I think Mary Ann did a wonderful job going through that today. It compares the environment impacts of Calvert Cliffs's license renewal and the alternatives, it reports the environmental impact of license renewal as small. Small is defined as the environmental effects are either not detectable or are so minor, they will neither destabilize nor noticeably alter any important attribute of the resource. In simple terms, there are no environmental impacts. Indeed, the land, the water, and the air are clean around here.

Each of the alternatives evaluated in this SEIS have been determined to have one or more significant impacts than license renewal in one or more category -- the document evaluated, the no-action alternative, coal-fired plants, gas-fired plants. Let me talk about some of the things it didn't evaluate and put it into context.

Many of us in the room here live in Calvert County. You can live in P.G. County, you can live in Anne Arundel County, Calvert County is about 200 square miles of space and land. Calvert Cliffs, a 1,700-megawatt plant which generates on the average 13 billion kilowatt hours a year, occupies only 280 acres, one-thousandths the size of the county. A 2,000-acre green space -- the rest of the site actually buffers the plant, and as pointed out, you can't see the plant as you drive by.

To replace Calvert Cliffs's electrical generation with wind-driven turbines or, as some of us call them, windmills, we would need to cover not 280 acres, 255,000 acres of windmills or 400 square miles, or two Calvert Counties.

If we were to look at solar and consider the average solar incidence in Maryland, solar would require two to three times that land area over the wind power option, 1000 square miles, five Calvert Counties.

If you were to look toward hydropower, we would have to create a 2,600 square mile reservoir to replace Calvert Cliffs.

BGE is committed to have a well-balanced, reliable, safe mix of energy sources for its customers in Maryland and elsewhere. We think that Calvert Cliffs is an important and reasonable part of that mix.

The environment around us is a complex one. We believe change should be considered carefully. After all the scientific studies and considerations that go into these actions, BGE feels it makes good sense to maintain the equilibrium established between the plant, the Bay, the air and the land.

I believe the consistent conclusion from all of the environmental reviews, assessments and evaluations is compelling.

The continued operation of Calvert Cliffs beyond the original license period will provide the people of Maryland with a safe and reliable source of energy.

The continued operation of Calvert Cliffs will continue to be a contributor to the environment by striking that careful balance between clean air and a stable energy supply.

The continued operation of Calvert Cliffs will provide economic stability to Maryland and to BGE.

We've spent the last three-and-a-half hours -- I'm going to take seven more minutes of your time. But I want -- we've been talking about something else that's not in this room, so in this part of my remarks, I would like to show you a short video of Calvert Cliffs and allow the plant to tell of its own role in our way of life here in Maryland.

| We realize and we want to say up front that no film ever escapes a critic, so I'll say up front
| that we're not Spielberg, nor do we intend to be or pretend to be. I believe the short clip,
| however, shows the essence of a great relationship between Calvert Cliffs and the rest of
| our community, and I'm going to let Calvert Cliffs tell the rest of the story.

| [Video presentation.]

| **Mr. Doroshuk:** I encourage you to stay around for the 7:00 session. We'll probably have
| the bugs worked out. But let me just say a couple of concluding remarks.

| We at BGE and at Calvert Cliffs take pride in our position as a good neighbor in the
| community. We believe this is widely recognized. The value of Calvert Cliffs is plain and
| simple. The value of the environment is also obvious to all. The video would have
| encouraged you to speak out. To all that have offered rationale input to the process, I want
| to thank you for taking part, all of you. Speaking for the employees, all the employees and
| the management at Calvert Cliffs, I would like to graciously thank everyone who
| demonstrated their support for this initiative. We believe it just makes sense to continue to
| preserve the safe, reliable and environmentally sound technology that Calvert Cliffs offers
| us.

| Thank you.

| **Mr. Cameron:** Thank you, Bart.

| We will be back here at 7:00. We may have a working video, and we'll see. But thank you
| for your patience and your tolerance.

| [Whereupon, at 5:55 p.m., the public meeting was concluded.]

Transcript of the Evening Public Meeting on April 6, 1999 in Solomons, Maryland

Ms. Kelley: Good evening.

I'm not a geologist, I am not an ecologist, and I know nothing about electro-magnetic fields. I am the president of the Board of County Commissioners of Calvert County, and I thank you for being here this evening, for conducting this session, and for allowing me to speak to you.

Obviously, a lot of time and effort has gone into this, and on the behalf of the citizens of Calvert County, we thank you for your efforts on our behalf.

It is truly a pleasure and a privilege for me to speak on behalf of BG&E and Calvert Cliffs. I'm not here to discuss technical issues. I'm here to discuss why the Board of County Commissioners fully supports the license renewal.

Calvert Cliffs is of vital importance to this community. BGE has been one of the driving forces that allowed this county to obtain the level of service that continues to increase the quality of life for our citizens.

Before Calvert Cliffs, Calvert County was one of the poorest counties in the State of Maryland. In 1975, when the plant opened, that turned around dramatically.

BGE brought Calvert new opportunities, including significant increases in employment, tax revenue, which translated to new schools, parks, staff, and other attractions, but they also brought other components to our community.

A60,
A.1.1

Their employees show up in our fire and rescue squads, volunteer programs, schools, churches, and their charitable contributions to the southern Maryland community has exceeded \$1 million a year since locating here.

It is true that Calvert Cliffs is one of our two largest employers and the largest private employer in southern Maryland.

It is true that they employ 1,150 of our citizens, and it is true that they have been our largest taxpayer, paying 19 ½ million in 1997 alone, almost 20 percent of our base. Of course, with deregulation, that's about to change, but we still like the fact that they are here.

Calvert Cliffs, however, has proven to be more to the county than just a large taxpayer and employer. They are a proven community member with a remarkable safety record, a steward of the environment, and continued supporter of our local business community.

BGE contributes over -- between one and two million dollars a year in contracts to the southern Maryland community and economy.

BGE owns and maintains about 2,300 acres, of which 2,000 acres are maintained as a wildlife preserve, thus protecting the bay shoreline from development, and as was noted in your study, we have had the crush of accelerated growth.

So, when we look at that as a preserved area that is not going to grow houses but, rather, a wildlife habitat, that is something that we very much appreciate.

A61, As far as we know, there's never been a negative environmental impact with their presence,
A.1.1 and environmental impact is very, very important to his county. Preservation and the environment are of paramount importance to the county, its citizens, and the county government.

We're sitting out here on this piece of dirt that's eight miles wide and 40 miles long surrounded by water. So, obviously, that is one of our primary considerations.

BGE has been a wonderful steward of the property which they hold in Calvert County.

We have two major environmental research facilities here, as you know, the National Academy of Sciences and Chesapeake Biological Lab, both of which support license renewal.

In almost 25 years of operation, no environmental harm that we are aware of has been detected within the aquatic environment of the Chesapeake Bay. Indeed, the puritan tiger beetle is alive and well.

Calvert Cliffs helps keep our air clean. Operating a nuclear facility as opposed to the fossil fuel plant is of benefit.

If you ask some of our residents who are near Chalk Point, I think that they will tell you that that plant is not nearly as clean as BG&E and a more desirable neighbor.

BGE is also a responsible member of our community and a significant contributor, as we I said before.

Now, the plant's been around for a long time, I think long enough for us to determine if there were negative environmental impacts from normal daily operations.

What is most important today and that is simply the finding that each of the assessed environmental issues was found to have small impact on the Calvert Cliffs license renewal.

Obviously, the safety of the plant, employees, and citizens of the county must continue to remain a top priority, and based on their track record, I am certain those areas will continue to be a top priority.

This is particularly important to us, because 42 percent of our population -- let me repeat that -- 42 percent of our population lives within that 10-mile emergency evacuation zone.

So, we are very much concerned about the safety factors and safety issues and are pleased with what we see so far.

And before I close, I would just like to say that we welcome the environmental impact statement. We know of the current record of the plant and the serious commitment to emergency preparedness and plant operations, and this county has been absolutely confident what the conclusions would be.

We regard Calvert Cliffs as a friend, partner, and asset to the community and fully support the re-licensing of the Calvert Cliffs plant.

Once again, I thank you very much for the opportunity to address you and wish you all a safe trip home.

Mr. Cameron: Thank you very much, President Kelley.

[Applause.]

Mr. Cameron: How about George Klein?

Mr. Klein: My name is George Klein. I'm here representing the Calvert County Waterman's Association. We fully back the renewed license of BG&E.

I am also a commercial waterman for the last 25 years. I have worked in front of the power plant over the years, and I see no impact of any kind of controversial against the crabs or the fish. As you can see, it hasn't hurt me nary a bit eating them.

A62,
A.1.1

I'm also the owner of Tall's Tackle Shop & Crab House in Chesapeake Beach, and BG&E has given the fishermen a whole lot of hope with the washout they have down there. Seventy percent of our fishermen head that way when they leave the harbor. So, it hasn't put no bad impact on them.

So, we are backing it 100 percent for the renewal.

Mr. Cameron: Thank you, Mr. Klein.

[Applause.]

| **Mr. Cameron:** Mr. Allhoff.

| Okay. I think we have Mr. Allhoff's comments for the record at any rate.

| Mr. Graf is still here, isn't he? There he is.

| **Mr. Graf:** I made my comments for the record this afternoon.

| **Mr. Cameron:** Okay. Thanks, Mr. Graf.

| David Jenkins.

| Hi, David.

| **Mr. Jenkins:** Again, David Jenkins, the Director of the Tri-County Council for Southern Maryland.

| Again, I was here earlier this afternoon and provided verbal testimony and again would offer support from the Tri-County Council for Southern Maryland for the license renewal.

A63, Again, the council consists of all the elected officials of southern Maryland, and BG&E has
A.1.1 been a responsible corporate neighbor for both Calvert County as well as the Tri-County Council area -- that is, Charles, St. Mary's, and Calvert county -- and both from a corporate neighbor contributing to the community as well as an environmental steward of the area.

| So, I would again provide that comment to you and again thank you for the opportunity to be here tonight.

| Thank you.

| **Mr. Cameron:** Okay. Thank you, David.

| [Applause.]

| **Mr. Cameron:** Angie Howard.

| **Ms. Howard:** If I may turn back this way, I also was here this afternoon and made a statement for the record, but for Mr. Klein and Madam Chair, just a point that -- I'm Angie Howard.

| I represent the Nuclear Energy Institute, which represents the nuclear energy industry throughout this country, and I was here to tell the folks that this is a very important thing for the nuclear industry.

Nuclear power represents 20 percent of the electricity in this country. It does so without emitting greenhouse gases into the atmosphere, and it's a very important part of our present contribution and a very important part in the future. A64, A.1.1

We must be able to meet clean air standards so that we can continue join not only what we have here in Maryland and Calvert County but around the country. So, it's very important.

My written statement also talked about the extensive comment period and public involvement that the Nuclear Regulatory Commission has included as a part of the entire process of developing the license renewal process and how we've gone through that, and there's been extensive public input and involvement like the meetings here but also throughout the whole process, and so, that's there, as well, and if you have any specific questions about the nuclear industry, I'd be glad to answer them for you.

So, Chip, I'll turn it back to you.

Thank you.

Mr. Cameron: Thank you, Angie.

[Applause.]

Mr. Cameron: And now is the moment that we have been waiting for all day.

Mr. Tenore: I want to make just an observation as an individual.

I happen to be the director of the Chesapeake Biological Lab here in Solomons, but I speak as an individual who's been here 15 years but was not here when this plant was developed, and I think the process, both in terms of the building of plants and what have you, although we're always concerned about any impact on the environment, has been a good one.

I think -- I know, early on, this company was very responsive to some of the changes that the scientists recommended early on when this plant was developed.

I think those recommendations were good at the time, and I think they served for a better plant and one that we can probably be proud of today and what have you.

So, I just wanted to mention that, in terms of the process that this is going on, I think it's been a responsive company that's really been taking some of the concerns that were brought up by the scientific community. A65, A.1.1

From my own expertise, I can say, certainly, that the monitoring part of the environmental impact statement is a strong -- has a good company that's been doing that work for the academy and what have you.

| So, I think that part of the environmental impact statement is a good one.

| Thanks a lot.

| **Mr. Cameron:** Thank you very much.

| Bart, are you ready to go?

| **Mr. Doroshuk:** Good evening.

| I also was present earlier this afternoon, and I'm going to incorporate my entire speech and remarks from earlier.

| I'm going to -- I'll make some abbreviated comments and hopefully conclude with what we tried to do before, but for the record, my name is Bart Doroshuk and I'm the director of the Life Cycle Management Project at the Calvert Cliffs nuclear power plant, and I'm responsible for producing the application that we're reviewing.

| I represent that Baltimore Gas & Electric Company at these U.S. NRC meetings, and the purpose of this meeting is for the NRC to offer another public opportunity to participate in the relicensing of Calvert Cliffs nuclear power plant.

| As we have heard, this particular opportunity in the process is to provide NRC with any comments on the supplement environmental impact statement for Calvert Cliffs.

| On behalf of BGE and the Calvert Cliffs family of approximately 2,000 men and women who work at the plant, let me express my thanks for the opportunity to make a statement regarding the environmental impact of license renewal for Calvert Cliffs.

| Tonight I will discuss briefly the findings of the U.S. NRC regarding the environmental effects of relicensing, and hopefully, I believe we have arranged for the plant to make a few statements on its own. We tried earlier but had a no-show, but I think it's here tonight.

| Those of you who were here last July heard me discuss the conclusions of BGE's own environmental review and some of the facts surrounding our decision to submit an application for license renewal.

| Some of the facts support our conclusion that it just makes good sense to continue to operate Calvert Cliffs.

A66, After we've looked at all the scientific data from Baltimore Gas & Electric to the National
A.1.1 Academies of Science to Pacific Northwest Lab to the NRC and we've taken into account all
| of the information about all the alternatives, we continue to believe that it makes good sense

to maintain the balance and the equilibrium that Mary Ann talked about earlier between the plant, the air, the bay, and the land.

The report does provide summary tables, and I'd like to point out that it does -- it reports that the environmental impact of license renewal is recognized as small in all categories, and I'd like to reread what small means, because I think it's very important.

Small is defined as the environmental effects are not detectable or they are so minor that they will neither de-stabilize nor noticeably alter any attribute of the resource that surrounds us. In simple terms, this means there are no environmental impacts.

The environment around us is a complex one, and we believe and Baltimore Gas & Electric believes that change should be carefully considered.

After all of the studies and considerations that go into it, we think it makes good sense to maintain this equilibrium I spoke about.

The consistent conclusion from all the reviews, assessments, and evaluations is compelling. The continued operation of Calvert Cliffs beyond the original license periods will provide the people of Maryland with a safe and reliable source of energy.

The continued operation of Calvert Cliffs will continue to contribute to the environment by striking that careful balance between clean air and a stable energy supply.

The continued operation of Calvert Cliffs will continue to provide an economic stability to Maryland and to BGE.

We've spent the last four hours this afternoon, an hour-and-a-half tonight, talking about something that's not in the room. So, as part of these remarks, I'd like to yield the rest of my time to Calvert Cliffs.

I assume we have the lens covers off, the switches are ready, and Mr. Sulu, take us out there somewhere.

[Video presentation.]

Mr. Cameron: Thank you very much, Bart. Do you have any concluding remarks?

Mr. Doroshuk: Yes. I just wanted to thank Calvert Cliffs for its remarks. I wanted to recognize the extensive efforts that the NRC is conducting and has conducted, as well as the laboratories. I think your teams are outstanding.

Appendix A

| I wanted to recognize and thank all of you for taking part in this process. Speaking for the
| employees and management of Calvert Cliffs, I'd like to graciously thank everyone who's
| demonstrated their support in this initiative.

| BGE believes it just makes sense to continue to preserve the safe, reliable, and
| environmentally sound technology that Calvert Cliffs offers us.

| Thank you, Chip.

| **Mr. Cameron:** Thank you very much, Bart.

| I don't think we have any further questions or comments out there. So, I think I could speak
| for the staff and P&L and say it was a real pleasure talking with you tonight, and we're
| adjourned.

| [Whereupon at, 9:07 p.m., the meeting was concluded.]

B. Written Statements Submitted at Public Meetings

Public Meeting on
Calvert Cliffs License Renewal Application
April 6, 1999

I am Dr. Joseph Mihursky, a University Professor and have been an applied aquatic ecologist for over 40 years. For many years I ran a field and laboratory research operation concerned with environmental effects of energy conversion systems such as nuclear power plants. Here in Maryland our study sites included a region around Calvert Cliffs as well as four other power plant sites. We were recognized as a "center of excellence" by Federal agencies and the State of Maryland. I have been advisor to other US States, the federal government and other nations of the world on these same environmental matters.

Regarding power plants we made a number of recommendations about site selection, engineering designs and operational features that in the main were implemented by BG&E in order to minimize biological damage to the local bay system. I heartily commend BG & E for doing so.

The Calvert Cliffs plant which requires 15 square mile feet of Bay water per day to release its waste heat, does effect pumped entrained and impinged organism because of required Bay water pass through of its heat exchange system. Organisms such as phytoplankton, zooplankton, shellfish and finfish eggs and larvae, small fish as well as combjellies and jellyfish may be damaged or killed. Because of the large hydraulic, mixing and diluting circumstances, effects upon Bay organism population dynamics is debatable or difficult to assess especially on a larger regional Bay wide scale.

Hydraulic and physical discontinuities of current velocities and temperature do influence normal seasonal behavior of mobile species such as finfish. Also water velocity has scoured about a 90-100 acre area in the high velocity discharge area and has resulted in a changed benthic community structure.

Although the above incremental effects on the local Bay system are known, the State and Federal regulatory agencies have deemed them acceptable in return for electricity production.

Although BG & E has worked hard at being a "good neighbor", personally I would prefer having a more benign and lower risk electricity producing system in operation, as I do live within the 10 mile radius of risk concern. I do understand, in detail, the process and procedures that led to the installation at this location by BG&E. The past is done. B1, A.1.2

My existing concerns as a local informed citizen of Calvert County for 38 years are five fold. One is continued storage of spent radioactive material on site, but I recognize the complexities of this national problem. Two is the eventual issue of decommissioning, burial cost and future care of the facility. Three is the question of the biological effects of batch release of radioactive tritium to the Bay. Although tritium is a weak beta emitter, it can be incorporated with water into the cell nucleus of rapidly developing early life history stages of Bay organisms such as oyster, clams, fish, etc. What does tritium uptake mean to the genetic well being of key Bay organisms? I am not aware that this question has been addressed at the Calvert Cliffs site. B2, A.1.13 B3, A.1.14 B4, A.1.5

Some years ago I was part of a federally appointed team to oversee the decontamination of the Three Mile Island facility after partial fuel rod meltdown and radioactive release. One of the recommendations eventually developed concerned

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precautionary measures about public safety whereby potassium iodide pills should be made available to every household and facility having children that were located within the critical area around a nuclear power plant. This recommendation recognized that children are highly prone to uptake of radioactive iodine that may be released from a plant incident. Such uptake can cause thyroid cancer problems. So, my fourth concern is that B5, A.1.11 since such precautionary measures are being followed by other U. S. States and nations of the world, why is such a policy not pursued here by government and management in the Calvert Cliffs region?

My fifth and final concern is a metallurgical one. I realize that a nuclear power B6, A.1.12 plant is an awesome engineering accomplishment. But, I also recognize that in the early days we did not have a sufficient data base on the effects of long term radiological emissions upon metallurgical properties. We now know that brittleness is one consequence of this exposure and results in "blowouts" of welds and piping. How is this substantial problem going to be avoided as this facility continues to age?

Thank you for the opportunity to comment on this very important societal matter.

J. A. Mihursky

**THE AMERICAN NUCLEAR SOCIETY
POSITION STATEMENT**

**NUCLEAR POWER:
THE LEADING STRATEGY FOR REDUCING CARBON EMISSIONS**

October 1998



The American Nuclear Society
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**NUCLEAR POWER:
THE LEADING STRATEGY FOR REDUCING CARBON EMISSIONS**

The American Nuclear Society believes that nuclear power should be utilized increasingly to meet the targets set by national governments for reducing global carbon dioxide emissions. Nuclear power is the only proven, large-scale source of electricity with near-zero carbon emissions.

The American Nuclear Society strongly recommends that nations continue to support research to determine the impact of man-made carbon dioxide on the Earth's climate¹. They should also examine and compare the complete costs of energy options, from mining to waste management, including environmental and social impacts.

Globally, nuclear power produces about 7% of the world's energy [1],[2] (BP 1998, EIA 1996). The U.S. Department of Energy states that the increase in non carbon-emitting energy over the past two decades was mostly due to the growth in nuclear power production[3] (EIA 1994). It concludes that, since electricity use significantly outpaced overall energy use, a potential course of action is to maximize the best-available electricity generation technologies. Countries that rely significantly on nuclear power have higher Gross Domestic Products (GDP) for the amount of carbon dioxide emitted. France, with 42% of its energy produced by nuclear plants, has the highest GDP per tonne of emitted carbon dioxide (EIA 1996). This is a clear example of the path that the world's nations should follow in order to reduce carbon emissions without impeding economic productivity.

Nuclear power is a safe, proven, sustainable, near zero-carbon energy source with tremendous current and future ability to reduce carbon dioxide emissions. **B7, A.1.1**

To minimize future emissions, nations should:

- Assure the continued operation of safe, existing nuclear power plants and facilitate the extension of their operating life,
- Strongly promote the development and deployment of optimized, advanced-design nuclear power technology that is more cost-competitive,
- Bolster the continued improvement of nuclear materials safeguards by the International Atomic Energy Agency (IAEA),
- Provide incentives for the use of energy sources that do not emit carbon dioxide. Encourage the use of renewable energies, where they can be shown to be economically beneficial and environmentally acceptable.

BACKGROUND AND BASIS

Nuclear power is the only sustainable energy option available for large-scale development to help meet future energy needs. After several decades of development by governments and investment by electric utilities, it currently provides about 7% of the world's energy supply and 17% of the world's electricity needs.

By 2050 the world's population is expected to reach 10 billion. The scale of economic activity then will likely be three to five times larger in order to meet the living standards of that population. The consumption of resources will increase markedly as the low-income countries embark on their own "Industrial Revolution" to achieve higher standards of living. Given these conditions, the use of non-carbon emitting energy sources must be maximized, if national and international carbon emission commitments are to be met.

Increasing the supply of nuclear electricity can help meet the goal of satisfying increasing public demands for clean, reliable energy, while at the same time limiting carbon dioxide emissions.

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Initially, the increase in nuclear power should take place in those countries that already have the necessary, established industrial infrastructure. In the less developed countries, as industrial infrastructures improve, nuclear power will be needed to develop their economies and reduce their dependence on fossil fuels.

The table shows the Gross Domestic Product (GDP) compared to the carbon emissions of the four largest world economies in terms of GDP per tonne of carbon dioxide emitted to the atmosphere. Also shown in the table are the data for the two largest populations of the world, China and India. Most of the more efficient countries obtain a significant part of their energy from nuclear power. France, for example, now relies on nuclear power for 42% of its energy and has the highest GDP/tonne of carbon emissions rating in the world.

GOODS AND SERVICES PRODUCED per TONNE OF CARBON DIOXIDE EMITTED \$GDP/tonne CO₂

(These six countries account for over 60% of the global economy and almost half the population)
1996 data from (BP, 1998; EIA, 1996)

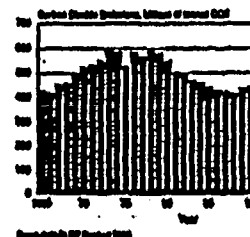
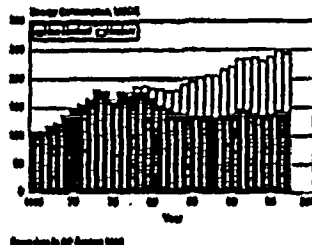
Country	Population Millions	Gross Domestic Product (GDP)(a) Billions US\$	\$GDP/tonne CO ₂	Of Total Energy Consumed % Nuclear
France	58	1456	3378	42
Japan	125	4319	2947	14
Germany	84	2096	1926	12
U.S.A.	266	7713	1148	8
India	952	567	534	1.4
China	1210	813	192	0.5

(a) Gross Domestic Product at Market Exchange Rates

The French program is a clear example of the potential of nuclear power to reduce carbon dioxide emissions. From 1998 data (BP 1998), French carbon dioxide emissions peaked at 600 million tonnes in 1973 when the total energy consumed was 180 million tonnes of oil equivalent (MTOE). By 1997, energy consumption had increased by 35% to 244 MTOE. However, as shown in the figures below, at the same time nuclear power had grown from 4 MTOE (2% of total) to 102 MTOE (42%), and carbon dioxide emissions had decreased by 28% to 430 million tonnes.

ENERGY USE IN FRANCE

FRENCH CARBON EMISSIONS



Nuclear power is an energy source that is safe, commercially proven, contains its waste products, and minimizes the environmental impacts of energy generation. The amount of waste produced is very small relative to the energy generated and methods are available for managing this waste. By using demonstrated technologies, nuclear fuel reserves in nature can be extended for centuries of operation. An important feature of nuclear power is that the cost of fuel is small compared with capital cost. Thus, once built, nuclear power plants produce electricity at a cost that is relatively insensitive to inflation or the fluctuations of prices on the world energy market.

The United Nations International Atomic Energy Agency (IAEA) has been effective at monitoring nuclear material safeguards and instrumental in obtaining international safety agreements. It should continue receiving strong, international support in its role of controlling nuclear proliferation while sharing the peaceful uses of nuclear technology. In addition, the World Association of Nuclear Operators has established high safety performance standards, and monitors and improves operations at facilities throughout the world.

Other than the traditional use of biomass, renewable energy sources currently provide about 2% of the world's energy, virtually all as hydroelectric power. Hydroelectric power could, if environmental concerns were managed, maintain its current contribution to the global energy supply, by utilizing all potential rivers. Even if the other renewable technologies such as wind, solar and biomass grow to contribute 40% of the global energy supply in 2050 (WEC/ILASA 1996), the World Energy Council predicts that carbon emissions would still increase to 50% above the 1990 levels.

Of the alternatives that the countries of the world must consider in strategies to reduce carbon dioxide emissions, maintaining and expanding the use of nuclear power is the leading solution and should be the preferred path.

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¹ The American Nuclear Society is not qualified to take a position on the scientific validity of the global warming or its relationship to industrialization. Nevertheless, many governments, including the U.S. government, have reached consensus that action should be taken to reduce carbon dioxide emissions, and have made international commitments towards this goal. The Society is uniquely qualified to comment on nuclear power's ability to support these international commitments.

Remarks on License Renewal

Angelina S. Howard
Senior Vice President
Nuclear Energy Institute

Solomons, Maryland
April 6, 1999

Good afternoon. I'm Angie Howard, senior vice president with the Nuclear Energy Institute. I am very pleased to have this opportunity to meet with you today.

The Nuclear Energy Institute is a Washington, D.C.-based policy organization that represents more than 275 U.S. and international companies in the nuclear energy industry.

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Our membership includes every U.S. utility that owns and operates a nuclear power plant, their suppliers, fuel cycle companies, universities, radiopharmaceutical firms and research laboratories, labor unions and law firms.

Many of the Institute's activities involve nuclear energy—which provides about 20 percent of America's electricity.

We're here today to discuss the draft supplemental environmental impact statement for Calvert Cliffs for the license renewal period.

After an extensive review, the NRC has found no significant environmental impact from license renewal for the Calvert Cliffs plant.

This review included potential environmental impacts from plant operation ... the plant's interaction with the land, water and air ... socioeconomic factors ... aquatic species ... threatened or endangered species ... and many other issues.

The NRC also thoroughly evaluated a new issue identified during the scoping review—microorganisms that live in high-radiation, high-temperature areas.

The agency concluded there is no significant impact associated with the issue.

The NRC also examined the environmental impacts of alternative energy sources, compared with the Calvert Cliffs plant.

Ultimately—when this extensive review was complete—the NRC concluded there are no environmental impacts that would preclude renewing the plant's operating license.

(Pause)

I'm here today primarily in a professional capacity, as a representative of the nuclear energy industry. But I'm also here as a resident of Anne Arundel County, just north of here.

My children love to play outside. In fact, both of them are very competitive tennis players. I want my children—and *your children*—to have clear air to breathe. As a wife and mother, I believe the clean generating capacity from this plant is needed.

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So I support nuclear plant license renewal, both personally and professionally, as one who has devoted nearly 30 years to learning how these plants work *from the inside out*.

License renewal for nuclear power plants is important to our nation's energy and environmental future. This nation already can't meet clear air requirements in many areas—and that is *with* nuclear power plants on line.

I commend the NRC for working—through a very open and public process—to develop a generic environmental impact statement for license renewal.

It helps ensure that no important issues are overlooked or left unexplored—while at the same time, it makes the review process effective and efficient.

That is what the federal government demands of its agencies today. And that is what American taxpayers demand. too.

The agency started preparing for license renewal several years ago, by identifying the types and severity of environmental impacts that could occur as a result of license renewal. The NRC concluded that many of these issues could be addressed generically—for all nuclear power plants—in a generic environmental impact statement.

The remaining potential environmental impacts must be addressed in the context of individual license renewal applications. That is what today's meeting is all about.

This approach allows the proceedings to focus on issues *germane to the individual plant* seeking license renewal—in this case, Calvert Cliffs.

The NRC plays a vital role in license renewal. But it isn't the NRC that will decide whether nuclear energy—or a particular nuclear power plant—is the right generating source for a given area. Its role is to determine—*solely from the safety standpoint*, whether a nuclear plant *may* continue to operate under a renewed license.

Over a period of years, the agency has made *tremendous* efforts to involve the public in license renewal in *meaningful ways*.

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The NRC issued its first proposal for amending the environmental rule for license renewal in 1994—*five years ago*. At the same time, the agency issued a draft generic environmental impact statement, inviting public comments. That was followed by numerous rounds of public comments—including public workshops in several regions of the country.

The NRC made a number of changes in the rule in response to comments. Then it issued the final revised environmental rule in June 1996 and it became effective in August 1996.

The same open process applies to the technical part of a license renewal application. It is a process that works.

What does license renewal mean?

Without a renewed license, a nuclear power plant *must shut down* when its current license expires. If the region later decides that it needs the emission-free generating capacity that plant provided—it will be too late. The time for making that decision will have passed.

But *with* a renewed license, continued operation remains an option. I happen to think it's an excellent one.

As some of you know, the NRC has taken steps to add discipline to the hearing process—both in determining whether a hearing is warranted, and in conducting a hearing if one is granted. The guidelines are straightforward. For a hearing to be granted, there must be significant new safety information to be considered.

That is a reasonable threshold.

Why put so much effort into nuclear plant license renewal? It offers three major benefits:

One, it will allow the United States to maintain economic electric generating capacity that does not produce greenhouse gases or other pollutants, such as sulfur dioxide, nitrogen oxide and particulates. B8, A.1.1

Two, license renewal will preserve good jobs for Americans—and substantial tax revenue for the communities where these plants are located. And ... B9, A.1.1

Three, renewal of a nuclear power plant's license is much cheaper than building new generating capacity. B10, A.1.1

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Many people don't realize that nuclear energy is the largest source of emission-free electricity generation in the United States. It represents 64.5 percent of our nation's emission-free electricity generating capacity. Hydro is second, with 34.9 percent.

Photovoltaic cells and wind power each represents less than .01 percent of our nation's emission-free capacity. Geothermal contributes a bit more—0.6 percent.

Under the Clean Air Act, states are under increasingly stringent controls on emissions of sulfur oxides, particulate matter, nitrogen oxides and ground-level ozone.

As an emission-free energy source, nuclear power plants already help limit the amount of greenhouse gases emitted through electricity generation.

Most nuclear power plants are in heavily populated areas of the country that are in "non-attainment" with the Clean Air Act for ozone or other regulated pollutants—even though those areas get a large amount of electricity from emission-free nuclear plants. Non-attainment status requires these areas or states to reduce pollution in the air.

The Environmental Protection Agency has even proposed capping nitrogen oxide emissions in 22 states that contribute to non-attainment for ozone in *other* states. *Maryland is one of these 22 states.* And that's *with* the emission-free Calvert Cliffs plant on line.

That's also why it is so important that Calvert Cliffs continues to operate. Baltimore Gas and Electric Company and Duke Power Company and are only the first applicants for nuclear plant license renewal.

There will be many others. Several other utilities¹ have indicated to the NRC that they are considering license renewal. Entergy Corp. plans to complete its application by the end of this year to renew the license for its Arkansas Nuclear One plant.

Nuclear energy provides important benefits to the United States, and the communities in which these plants are located. It provides vast amounts of electricity—on demand—to support continued economic growth and our high standard of living. And it does all this without polluting the air.

¹ Entergy Operations, Florida Power & Light, Northern States Power Co., PECO Energy, Southern Nuclear Operating Co. and Virginia Power. In addition, Carolina Power & Light CEO William Cavanaugh told *Nucleonics Week* in late June that he is "pretty certain" his company will try to extend the licenses of its four nuclear units.

The fact is, the United States can't meet existing clean-air regulations without continued—and expanded—use of nuclear energy.

Thank you.

**Baltimore Gas & Electric Statement at the
United States Nuclear Regulatory Commission
Public Comment Meetings on the
Draft Supplemental Environmental Impact Statement for the
Calvert Cliffs Nuclear Power Plant**

Good afternoon/evening. My name is Barth W. Doroshuk and I am the Director of the Life Cycle Management Project at the Calvert Cliffs Nuclear Power Plant (Calvert Cliffs). I am representing the Baltimore Gas & Electric Company (BGE) at these United States Nuclear Regulatory Commission (USNRC) meetings. The purpose of this meeting is for the NRC to offer the public another opportunity to participate in the re-licensing process of Calvert Cliffs. As we have heard, this particular opportunity in the process is to provide NRC with any comments on this document, the plant specific supplement to the Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants. On behalf of BGE and the Calvert Cliffs family of approximately two thousand men and women who work at the plant, let me express my thanks for the opportunity to make a statement regarding the environmental impact of license renewal for Calvert Cliffs.

Today I would like to discuss two subjects with you, and then I will yield my remaining time to the other speaker for BGE.

First, I would like to discuss the openness of the overall re-licensing process and in particular that of Calvert Cliffs. The second subject I will discuss is the findings of the USNRC regarding the environmental effects of re-licensing. Finally, I have arranged for Calvert Cliffs to make a few statements on behalf of itself relative to the surrounding environment and its role in Maryland, and as a part of the BGE family.

There has been some interest in the public process of the re-licensing of nuclear power plants. Let me briefly describe how open the environmental review has been, how many opportunities there have been for public input.

I want to do this by looking at the openness of the overall regulatory process and how open our minds have been about listening to everyone. Then I want to look at how open our "door" has been to everyone and tell about some of those who have taken advantage of it. And finally I will let you know about our ongoing open invitation to address your ideas, questions and suggestions.

Before our application, the NRC conducted a five-year public proceeding to prepare the Generic Environmental Impact Statement on license renewal. This proceeding included public workshops, several opportunities to submit written comments on the draft generic environmental impact statement, and a formal rulemaking.

Then, in our proceeding, the NRC staff has conducted scoping meetings and prepared a draft supplement looking at the site-specific impacts of renewing Calvert Cliffs licenses. The NRC staff has looked at all the issues that were generically resolved in the GEIS and determined that they remain valid for Calvert Cliffs. In addition, the staff has looked at the issues that were not resolved in the GEIS and found that any impacts associated with these issues are small. The public now has not only the opportunity to express its views today, but also the opportunity to submit written comments on the draft SEIS.

In July of last year, many of us met in this same location to express our opinions and submit our comments about the scope of the environmental assessment that would occur as part of the review of BGE's license renewal application.

B11, A.1.3

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This process has been much more than writing letters. The NRC listened to our ideas and suggestions. They have even enlisted the assistance of a national laboratory to help them review all of the information. As a result of comments made last July, the scope of the review was expanded.

Looking closer to home at this issue, since 1993, BGE has held in excess of 60 public meetings with the NRC (no fewer than 14 public meeting in the last 12 months) on the topic of license renewal, and has submitted on the public record literally hundreds of documents detailing our efforts.

Apart from the license renewal process, Calvert Cliffs has a visitor's center open seven days a week. The Calvert Cliffs family hosts, on average, 3000 people per month who come to visit us. These visits allow for learning by our visitors and listening by BGE.

In addition, there is an open invitation for visitors to request a tour of the actual plant - inside the fence, inside the buildings. Every year BGE conducts somewhere between 100 to 150 tours of Calvert Cliffs by our visitors without hesitation.

If anyone has a safety concern or any information anytime that indicates the environment is being disturbed there is virtually an unlimited number of avenues to get that information to BGE, the NRC, the State of Maryland or whoever the right people are. You can even dial a toll-free number if need be, or you can e-mail us, or you can simply stop by. I think the process has offered all an enormous amount of opportunity to participate.

Those of you who were here last July heard me discuss the conclusions of BGE's own environmental review and some of the facts surrounding our decision to submit our applications, some of the facts supporting our conclusion that it makes good sense to continue to operate the plant.

After all the scientific studies we have conducted and after taking into account all of the considerations and alternative actions, BGE continues to believe that it makes good sense to maintain the equilibrium established between the plant, the air, the Bay and the land.

I would draw everyone's attention to Table 9-1, on page 9-6. I believe that table says it all. It summarizes and compares the environmental impacts of Calvert Cliffs' license renewal and the alternatives. It reports that the environmental impact of license renewal is recognized as small in all impact categories. Small is defined as "environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource." In simple terms, this means there are no environmental impacts from license renewal on Calvert Cliffs.

Indeed, the land, the water, and the air are clean around here.

Each of the alternatives evaluated within the SEIS has been determined to have more significant impact than license renewal in one or more impact category. The document evaluated the no-action alternative, and coal-fired and gas-fired power replacements. Let me briefly discuss some of the alternatives that did not make the final assessment and the reasons why.

Many of us in this room live here in Calvert County. This county has 213 square miles of land space. Calvert Cliffs, a 1709-megawatt power plant which generates on average approximately 13

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billion kilowatt-hours of electricity, occupies only 280 acres at the Calvert Cliffs site. A 2000-acre green-space buffer, the remainder of the Calvert Cliffs site, surrounds the plant. To replace Calvert Cliffs' electrical generation with wind-driven turbines or windmills, we would need to cover 255 thousand acres, or 400 square miles, almost twice the land area of Calvert County. If we look at solar and consider the average solar incidence in Maryland, solar power would require two to three times the land area of the wind power option - over 1000 square miles. Hydropower replacement would require a 2600 square mile area of reservoir-covered land to generate the power of Calvert Cliffs. In the eastern United States, we simply don't have the land area to consider the wind, solar, or hydro alternatives.

The environment around us is a complex one, and we believe change should be carefully considered. After all the scientific studies and considerations that go into alternative actions, BGE feels that it makes good sense to maintain the equilibrium established between the plant, the air, the Bay and the land.

I believe the consistent conclusion from all of the environmental reviews, assessments, and evaluations is compelling. The continued operation of Calvert Cliffs beyond the original licensed periods will provide the people of Maryland with a safe and reliable source of energy. The continued operation of Calvert Cliffs will continue to be a contributor to the environment by striking that careful balance between clean air and a stable energy supply. The continued operation of Calvert Cliffs will continue to provide economic stability to Maryland and BGE.

We have spent the last two and one-half hours talking about something that is not in the room. So in this part of my remarks I would like to show you a short video of Calvert Cliffs and allow the plant to tell of its role in our way of life here in Maryland. We realize, and want to say up front, that no film ever escapes a critic! So let me say up front that Spielbergs we are not, nor do we pretend to be! I believe this short clip shows the essence of the great relationship Calvert Cliffs has with our community. I believe I will let Calvert Cliffs speak for itself.

.....
We at BGE and Calvert Cliffs take pride in our position as a good neighbor in this community. We believe that this is widely recognized. The value of Calvert Cliffs is plain and simple. The value of the environment is also obvious to us all.

The video encourages people to speak out. To all that have offered rational input to this process, I thank you for taking part. Speaking for all the employees and management at Calvert Cliffs, I would like to graciously thank everyone who demonstrated their support of our initiative.

BGE believes it just makes sense to continue to preserve the safe, reliable and environmentally sound technology that Calvert Cliffs offers us.

Thank you.

B12, A.1.15

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Third Draft: 5/28/98
revised final

CALVERT CLIFFS:
A BEACON OF ENERGY
 A CREATIVE VIDEO SCRIPT FOR
BALTIMORE GAS AND ELECTRIC COMPANY

September 25, 1998

Reminders: Visuals precede spoken words.
 All visuals and music elements are suggestions only.
 All narration is voice-over.

NOTE: *In what follows, all shots marked with (A) below should be readily available from BGE video library archives or from other existing sources.*

Video

Audio

FADE UP

(MUSIC/SFX: Gentle acoustic guitar music, bluegrass or folk style, mixed with the natural sounds of the sea.)

Waves lap the rocky Atlantic coastline as we glide forward. Somehow the lighting suggests early evening, and we can almost smell the freshness of the salty breeze.

A lone figure in the distance is moving toward something just up from the shoreline. Closer shots reveal a man, dressed simply in modern-day denim and flannel and good workman's shoes. Clean-shaven and 40 or above, he strolls calmly toward a lighthouse. We cannot identify him.
 (Option to shoot actual lighthouse—Cove Point Lighthouse on Chesapeake Bay.)

(NARRATOR, V/O:) Consider the lighthouse.

It's a simple idea.

If possible, we show the man entering the building; (edit to) arriving at the top, and settling in. His facial features remain dim or out of frame.

Based on a sturdy tower, a large window, and a steady source of light.

His hands begin to flip switches. We see a big Navy ring. (Or: stock footage of other lighthouses.)

It reminds us how, for centuries, the protection of others has often rested upon something as safe and reliable ...

Transition to stock footage of a lighthouse beam sweeping through the night. Slow it down for enhanced effect.

... as a beacon of light.

(SFX: There's a kind of voice to the beacon, a throaty and reassuring hum that crescendos during the sweep.)

The beam languidly sweeps over us.

Transition to an aerial night skyscape of Baltimore, an arcing and elegant shot. Among the skyscrapers, layer in night scenes of marquee lights and traffic.

(SFX: Mixed under, the dynamic sounds of urban nightlife.)

(NARRATOR:) Today, the kind of energy we harness can be much more complex.

Transition to an early morning shot, bayside, aerial. We swoop in over water.

We come upon the rounded towers behind the bay.

A circle wipe creates a swift "moving beam" effect via highlight and subdue.

Titles appear over it.

Baltimore Gas and Electric Company presents ...

Calvert Cliffs: *A Beacon of Energy*

Interior, a home in the area. Lit for early morning. A digital alarm clock display changes to 6:00 a.m. and starts to buzz.

Key words on screen in large translucent text:
safe
reliable

Transition to interior shot, Calvert Cliffs, showing mammoth control panel (A).

(NARRATOR:) Yet here, the bay is tranquil ... just as the idea behind harnessing energy is simple.

This is the Calvert Cliffs Nuclear Power Plant.

Think of it as ...

A Beacon of Energy.

(MUSIC: By now, other musical instruments have joined the guitar and the rich sound comes up full.)

(MUSIC: Somewhat faster now.)

Time has proven nuclear energy to be safe and reliable.

(SFX: Alarm clock buzz, muffled under the soothing music.)

Since 1975, the people of Central and Southern Maryland have experienced the value of Calvert Cliffs.

Transition to interior shot, Calvert Cliffs, featuring massive turbines (A). Option to surround the central part of the image with edge pix layered on showing energy use. These might include a designer lamp from an office setting, a hand-held hair dryer in a teen girl's hand, a toddler at a plug-in toy keyboard, and a high-speed Pepsi bottling machine or web press from the Baltimore Sun. (A)

Let the high-speed machine shot engulf the screen. (A) Subdue 40% of it, with CG over:
40%

Fly over it in diagonal fashion the key word, again large and translucent: energy

Animate or step-animate a red arrow ratcheting down over a scenic Maryland background. A headline appears with words to this effect: BGE announces 11th consecutive fuel rate decrease

Also, in the upper-right corner, as spoken, we see the words: lower rates

Need a generic figure to show over a shot of many crowded people in a downtown Baltimore scene. CG over: billions

Archive shot from BGE emphasizing a technical or engineering staffer at work. (A)

Light, heat, music, industrial muscle ...

... 40% of it has come from here.

Calvert Cliffs has brought us lower rates.

With a combined cost savings ... over the lifetime of the plant ... in the billions.

There is value, not only in the energy itself, but also in the technology behind it.

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Plant exterior. Transition to lush farming shot, angled to emphasize some verdant acres. (A)

Owls, deer, osprey, or bald eagle shot #1. (A) Key work onscreen: friendly

A tractor makes its circuit. (A)

Marsh shot. Woodlands shot. A birdling or beastie peers furtively from the brush. (A)

Tiger beetle beauty shot. (A)

BGE people setting up nest boxes and perches or otherwise tending the wilderness. (A)

Bald eagle winging overhead. (A)

Consider the many *kinds* of value from Calvert Cliffs.

First, like the lighthouse, it is friendly to the neighboring environment. Of the 23-hundred acre property, less than 20% belongs to the plant site.

Nearly 130 acres are farmlands.

The rest is marsh ... and woodlands. In fact, the site has been called "the last relatively pristine cliff ecosystem left ... on Chesapeake Bay."

It supports about 90% of the world population of the rare "puritan tiger beetle."

BGE people have helped. And in so doing, have won praise from the Wildlife Habitat Council ...

... and The Nature Conservancy..

Hikers or walkers on a nature trail at Calvert Cliffs. (Preferably, someone has a staff. Option for opening shot to favor feet climbing or walking, for a light play on the word "afoot" in narration. Then open up the shot to emphasize the people and close on their friendly expressions.) (A)

Major visual transition. Return to lighthouse exterior.

Inside, the hands are now using a humble polishing cloth to shine up some metal, glass, or wood.

Montage, Calvert Cliffs people at work, with figures over the blend. (A)

Archive shot in motion of ethnic husband/wife, mature (senior) citizens enjoying an active lifestyle (perhaps golf or tennis course). (A) sense of the size and scope of the complex. (A)

The air is fresh here. And, there's a new trend afoot.

Today, more people who fear global warming ... favor nuclear energy.

(MUSIC: Major transition here.)

The lighthouse brought a steady living ...

... to those who faithfully tended it.

So too, Calvert Cliffs has created thousands of jobs ... and meant hundreds of millions to the local economy.

As the largest private employer in southern Maryland, Calvert Cliffs represents more than \$79 million in annual salaries and pays over \$20 million each year in local taxes.

More of the same. Option to add on dollar sign icons, sized to represent the 8-fold-plus difference.

Clearly, the plant transcends its role as a generator of electricity; Calvert Cliffs adds value to the quality of life in Maryland.

Archive pix from history files; blended still or motion footage of Calvert Cliffs under construction.

Show dry storage facilities. Add other pix to match.

Safety continues to be a priority. BGE has long held to a maintenance standard that far exceeds industry norms. For both equipment and systems, we have aggressively rebuilt, restored, refurbished, and replaced.

New angle, steam generator.

For example, BGE has already announced plans to replace both steam generators, to ensure reliability. This effort alone means a commitment of \$300 million over the next five years.

A different scene to suggest size/scope of facility.

Today, the future of this plant is under review.

Key word on screen (CG):
value
Aerial of Washington DC's "monument
alley," leading to the Capitol. (A) CG
over:

Nuclear Regulatory Commission
(show NRC symbol as well)

The Nuclear Regulatory Commission requires relicensing of any nuclear power plant after the first 40 years of service.

BGE staffers collating reams of paper into reports. Add generic pix to match.

And although our deadline is technically *years* in the future, we have already started meeting it *now*. It's a pioneering move. BGE is the first in the nation to request a licence extension.

Mid-level staff meeting on the project, with many notebooks and resources on the conference table.

The commitment required is immense. With an application cost alone approaching \$15 million dollars.

Generic pix to match. (Possibly a shot of staffers unloading the application. If so, make sure we see doc cover or add CG to explain what's going on.)

Even so, we can assume nothing. Because relicensing is more than a *goal*. It's a *process*. With significant opportunities for the public to voice an opinion. And with the NRC making the final decision.

Baltimore citizens at work and play.

In short, while Calvert Cliffs serves the community, the community also needs to give at least moral support to this effort ... since the outcome is *by no means* guaranteed.

Key word on screen:
future

Return to exterior of lighthouse at work.

Return to earlier "throaty hum" scene and recraft it to suggest the lighthouse beam going out and its warm voice dying away.

Dip to black.

Nuclear engineer (man). Public relations staff member (woman).

Montage with exteriors of local hospital, school, retail center. (A) Or: Blended diversity shots with many faces. (A) Either way, wrap around it with the border of Maryland.

Chris Poindexter and other top executives around a conference table, planning. (A)

Shot from a meeting involving public response. (Or, pix to match.)

A person favoring Calvert Cliffs steps to the microphone and begins to speak. (Or, pix to match.)

Daytime aerial over Calvert Cliffs.

After all ... what if the light ... went out?

For now, Calvert Cliffs means stability. Security.

It's a resource worthy of preserving not only for the stakeholders involved, but also for the entire state of Maryland.

BGE is taking strategic actions to be a good corporate citizen. And to act on this urgent need.

We ask nothing of you but your voice.

If you *care* about a positive outcome, let it be *heard*.

(S.O.T. - We hear a few words from the citizen—enough to sense support of Calvert Cliffs—prior to the crossfade.)

Our message is simple.

Blend visuals seen earlier with key words floating over as spoken, especially: *alarm clock, high-speed machine, eagle, working people, senior couple, child at toy keyboard.*
CG:
safe
reliable
energy
friendly
value
future

Return to the lighthouse scenes from the opening.

Match dissolve from a wide-angle, upward shot of the lighthouse to a wide-angle, upward shot of one of the nuclear towers at BGE.

Now, it is not the twilight after sunset, but the twilight before sunrise. We see the same male worker as in the open. This time, he steps from the bay shoreline up a grassy knoll to approach—not the lighthouse—but instead, Calvert Cliffs.

Based on a *safe* and *reliable* source of *energy* ... one that's proven itself *friendly* to the environment as well as to customers ... Calvert Cliffs nuclear power plant has brought us all considerable *value*. And will continue to do so in the *future*.

(MUSIC: Slow again. We gradually lose instruments, until only the guitar line remains.)

(NARRATOR:) The lighthouse brought a message of security, and yet ...

... we cannot take this resource for granted. Together we must make a commitment to preserve the *investment*. Preserve the *technology*. Preserve the *value*. Preserve the *jobs*. And preserve the *tradition* ...

The camera tracks up from behind him, and then somehow gets ahead of him, and looks back.

We see the face now. The man is Chris Poindexter.

He smiles in a craggy sort of way, and we get the feeling of a steady hand at the helm.

Then, from a daylight aerial now filtered day-for-night to resemble a night scene, the image freezes and a "beacon" effect sweeps in a clockwise motion from the two towers, lighthouse-fashion.

Transition to the Atlantic ocean, reliably and safely sending waves upon the shore.

Fly on BGE bug logo.
Add copyright information.

Fade to black.

((ESTIMATED TRT: 7:10 at 45 seconds per page for 9.5 pages. We factored out page breaks.))

... that we know today as Calvert Cliffs.

Think of it as ...

A Beacon of Energy.

(SFX: Sea gulls.)

(MUSIC: Crescendo.)

PRODUCTION NOTES

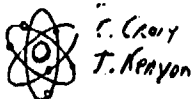
1. Although all the key words show here in the identical font as other CG, such as "lower rates," I suggest you give the key words their own unique look and feel in your choice of CG font, to enhance visual continuity.
2. I left the term "puritan tiger beetle" offscreen deliberately, since we already have viewers reading a lot of text. If this causes curiosity among them, so much the better.
3. I think the "x" in NOx is subscript; please confirm.
4. On page 7, I chose to omit the number of years in the future the deadline is [16 to 17], since I was concerned that it might undermine the viewers' sense of urgency about making their positive comments known. It also allows the speaker to fill in that gap, and protects the shelf life of your program.
5. Anywhere you wish to cut back, feel free. My vision is for this show to be tightly paced and not overly encumbered with details that might detract from the key message.
6. On page 8, I chose not to put the number of \$300 million in CG. It's big enough to be memorable, and has already been published in various places.
7. Same page, I hope the "we can assume nothing" line is acceptable. Let viewers feel that they're needed.
8. Feel free to call, any time. I'll be happy to tweak where needed to help you make it great! I'm out tomorrow afternoon, but should be easy to find Friday and Monday. Good luck!

October 1999

A-122

NUREG-1437, Supplement 1

LETTER C



Dr. and Mrs. Gerald R. Mazette
Post Office Box 660
Huntsville, Virginia 22075
(800) 600-6520 FAX (800) 600-6529

March 2, 1999

Chairman Shirley Ann Jackson
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-001

Chief, Rules Review and Directives Branch
Division of Administrative Services
Mailstop T-6D 69
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

**SUBJECT: REQUEST FOR COMMENT OF CALVERT CLIFFS NUCLEAR
POWER PLANT DRAFT SUPPLEMENT TO THE GENERIC ENVIRONMENTAL
IMPACT STATEMENT, NUREG-1437, Supplement 1**

Thank you for sending a copy of NUREG-1437, Supplement 1 dated February 1999. As a private citizen, former naval officer, and retired NRC employee, I have no bias against commercial nuclear power stations, and believe in a strong national defense. Notwithstanding these views, I ask that the NRC work with the U.S. Navy to reassess their estimate of the current risk to the environment of an aircraft crash at the Calvert Cliffs Nuclear Power Station (CCNPS) for the following reasons:

- ♦ The Navy has recently proposed increasing aircraft tests and pilot training in the environment of CCNPS (see the "Final Environmental Impact Statement For Increased Flight and Related Operations in the Patuxent River Complex," dated December 1998). FEIS Table 2-2 makes it clear that these aircraft tests include determining "...the edges of the safe flight envelope..." for prototype aircraft. The Navy gives no quantitative analysis of the potential for, or consequences of, an aircraft crash into CCNPS.
- ♦ USNRC NUREG-1437, Supplement 1 makes no mention of the increased risk to CCNPS due to the increased frequency of military aircraft flights. The CCNPS site is distinctive...it is uniquely bordered by the Military Training Routes (MTR) about 10 miles to the northwest and the Chesapeake Test Range (CTR) a couple miles to the southeast (see the enclosed map).
- ♦ Previous judgments by the NRC on the potential for an aircraft crash during the construction and operation of CCNPS should now be re-examined due to the increased funneling of test pilots and new or experimental aircraft from closed military bases to PAX the past 8-10 years (see FEIS page 1-2, "DoD is currently implementing more than 500 decisions of the Base Closure and Realignment Commission [BRAC] to realign or consolidate military activities, or to close military

RECEIVED
MAR -8 AM 9:30
RULES & ENVIRONMENT
US NRC

C, A.1.11

C-1

installations"). Such activities are expected to continue and are outlined in the Navy's Integrated Management Plan (IMP) for the Patuxent River Complex.

The NRC and the Navy have an obligation to work together to quantify such risk increases to CCNPS. To be credible, such an analysis must consider actual flight crash data for the tri-state area (Virginia, Maryland, Delaware). Such a database could be similar to the sample crash data included in the document to Ms. Kelly Burdick, "Comments on the Final Environmental Impact Statement," dated January 11, 1999 by G.R. Mazette. GAO reviewed all military aircraft accidents and found that the frequency of aircraft Class "A" mishaps¹ is about 76 per year, translating to 1.6 per 100,000 flying hours (GAO/NSIAD-96-69 BR). It then follows that as the frequency of flight operations (total flying hours) increases at the Patuxent River Complex, the frequency of crashes could increase. Since full disclosure of significant environmental impacts is required by federal law, the NRC and Navy should combine their expertise to demonstrate that the risk to the environment from an aircraft crash at CCNPS is acceptable for the remainder of the current license, and for the extended renewal period.

It is clear that military aircraft crashes are a fact. Two contrasting types of in-flight aircraft accidents are particularly relevant. In the first example, which begins as a total engine failure in an F-16 jet fighter, the pilot does not eject and proceeds to land his aircraft safely. In the second example, which also begins as a total engine failure in an F-16, the pilot ejects. This unmanned, out-of-control F-16 jet fighter then proceeds to travel a significant distance before crashing. The points to be made in these two examples are that air corridor restrictions, while helpful during normal maneuvers, completely vanish when an aircraft is out of control. Second, while the latter example would appear in the data as a Class "A" mishap for a risk assessment, the first example would not. A more rigorous investigation is needed by the analyst to consider such "close calls", which cannot be ignored in a credible risk study.

The military would acknowledge that the NRC retains the greater appreciation for the true magnitude of the radiological consequences that could be involved from an aircraft crash into the CCNPS reactor building or spent fuel pool building. The NRC should recommend that the Navy hold up their proposed increases in flight operations until these crash data are collected, the risk analysis is performed, and independent reviews have been completed.

Respectfully,

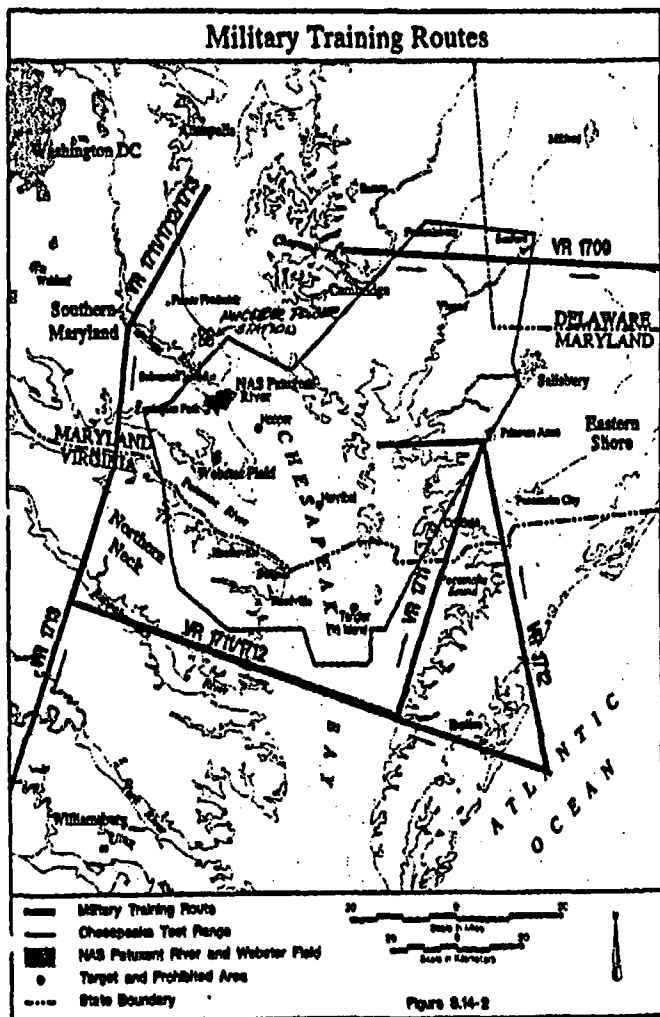

Dr. Gerald R. Mazette

Cc: Ms. Kelly Burdick, Office of Legal Counsel, Patuxent River

¹ Class "A" aircraft mishaps are defined as those involving a fatality, permanent disability or at least \$1 million damage

C-2

Appendix A



C-3

LETTER D

DS09
C. Gray

From: *T. Hinton* George Abbe <abbe@acnatsci.org>
To: OWFN_DO.owf2_po(CCEIS)
Date: Thu, Feb 25, 1999 3:27 PM
Subject: Calvert Cliffs

Claudia,

The reference to Abbe, 1992 on page 4-31 of the Draft Report should read D, A.1.18
"Population structure of the eastern oyster.." not "Pollution structure".

George Abbe

D-1

October 1999

A-124

NUREG-1437, Supplement 1

LETTER E

From: "sheldon samuels" <sheljean@olg.com>
To: OWFN_DO.owf2_po(CCEIS)
Date: Mon, Mar 8, 1999 2:00 PM
Subject: comments on draft supplement

To: David B. Matthews
From: S.W. Samuels
Ramazzini Institute
Re: Comments on Draft Supplement to GEIS for CCNPP

N.B., the following are personal comments and do not reflect the views of the Ramazzini Institute, which takes no positions on regulatory or legislative issues.

Alternatives to license renewal

Both the GEIS and the supplement are using obsolescent views on alternatives. Shelf technology for widely used fuel cells manufactured by United Technologies Inter alia, can replace grid supplied energy for buildings throughout BGE market, with grid supplies as back-up. This is a reversal (nonetheless feasible) of their usual application. The range of fuel - from LNG to hydrogen - and inherent fuel efficiencies provides a range of alternatives each of which has less environmental impact than any of the other alternatives discussed.

Waste Disposal

Given the continued objections of the states of Nevada and Utah to long or short term storage of waste, the draft is defective in not discussing the impact of on-site alternative disposal. The nationally-distributed costs of waste disposal at Yucca Mountain and so-called short-term disposal sites are not calculated or included.

On 5.2.2.1 BGE Risk Estimates

This is a defective analysis for the following reasons:

1) while there is little data available, itself a notable item to be included, the effects of aging on the risks of abnormal operation need documentation.

2) the averaging over a 50 mile radius is totally inappropriate. Windrose analysis within a ten mile radius, with calculations of the spectrum of impacts on the intra-radial high density, clearly identifiable communities needs to be done. The impacts need to be separated further in each community by age group, especially ages 0 through 12, during which time iodine uptake would be greatest. An estimate must be made of impact on children at home, e.g. infants and pre-schoolers.

National Environmental Impact

It is not possible to ignore the locally-located nationally distributed impacts of the national burden of continued uranium mining, milling and fuel rod manufacture.

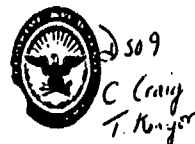
I am disappointed in the failure of the statement to discuss these issues. You may have grounds for dismissing these points, but none exist for not noting or discussing their relevance.

It is not necessary to appear at the hearing to make these points. However, at your invitation, I would be willing to elaborate or answer questions in the forum of the hearing.

March 8, 1999

E-1

LETTER F



DEPARTMENT OF THE NAVY
NAVAL AIR STATION
22266 CEDAR POINT ROAD
PATUXENT RIVER, MARYLAND 20670-1154

RECEIVED

1999 MAR 22 AM 8:30

E1, A.1.15

Ms. Shirley Ann Jackson, Chairman
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Ms. Jackson:

E2, A.1.13

A member of my staff received a copy of a letter that Dr. Gerald Mazetis sent you regarding the potential impacts of Patuxent River Complex flight operations on the Calvert Cliffs Nuclear Power Plant. Dr. Mazetis also expressed his concerns in a formal comment to our Final Environmental Impact Statement for Increased Flight and Related Operations in the Patuxent River Complex (FEIS). The following background information and specific observations relative to Dr. Mazetis' comments may help the Nuclear Regulatory Commission in reviewing this case.

E3, A.1.10

The Patuxent River Complex consists of the test areas under the exclusive control and scheduling authority of the Naval Air Warfare Center, Aircraft Division (NAWCAD). The complex includes the Naval Air Station, Patuxent River Outlying Field (OLF) Webster Field, and the Chesapeake Test Range (CTR). The test areas include flight and ground test facilities, runways, special use and restricted airspace, aerial and surface firing range, and three targets in a restricted area of the Chesapeake Bay.

E4, A.1.9

We undertook the Environmental Impact Statement (EIS) analysis to determine how we could meet our environmental stewardship mission while optimizing use of the current ranges and facilities that make up the Patuxent River Complex. The current range boundaries were designated by the Federal Aviation Administration in 1942. Our facilities, which we want to use even more efficiently, are in place now that the Department of Defense (DOD) Base Realignment and Closure (BRAC) moves are complete. The BRAC process considered costs, benefits and global defense needs in consolidations DOD-wide. We summarized all of our operational projections, as identified in the Integrated Management Plan, in Table 2-9 of the FEIS. If you would like a copy of the FEIS, I would be happy to forward one to you.

F-1

Appendix A

F, A.1.11

The three alternatives considered in the FEIS focus on the efficient use of existing facilities and personnel in the Patuxent River Complex and provide for the continuation of and increase in RDT&E flight and related ground operations, and additional support for military training activities. The preferred alternative (Operational Workload Alternative III) could accommodate up to 24,400 flight hours per year. Operational Workload Alternatives I and II could accommodate up to 20,700 and 22,600 flight hours per year, respectively. Implementation of any alternative would do three things. First, implementation would maintain existing boundaries of the special use airspace and restricted surface areas in the CTR. Second, implementation would continue airfield daily operating hours at current, or slightly modified operating hours. Third, implementation would require neither additional permanent and transient employees at NAS Patuxent River and OLF Webster Field nor construction of major new facilities beyond those constructed as a result of BRAC decisions.

Our Record of Decision included a brief discussion of the Calvert Cliffs Nuclear Power Station. However, as we explained to Dr. Mazetis in our FEIS response letter to him, the power station is outside of the Chesapeake Test Range. I have enclosed a map of the Chesapeake Test Range that shows our proximity to the power plant. Patuxent River-based aircraft that might be seen in the vicinity of power plant would be doing standard take-offs and landings. Our prototype aircraft testing is done in restricted areas of the Chesapeake Test Range, such as near Hannibal and Tangier targets.

In our letter to Dr. Mazetis, we explained that the power plant owner, Baltimore Gas and Electric (BG&E), has completed and submitted risk assessment reports to the Nuclear Regulatory Commission on aircraft-associated safety risks. BG&E submitted the first study, entitled *Individual Plant Examination of External Events*, in August 1997. This study found the probability of an aircraft crashing into the power station, including aircraft from the Patuxent River Complex, to be 1.1×10^{-6} per year. BG&E identified about 25 percent of this low risk to be associated with our operations. In a second report to the Nuclear Regulatory Commission, called Region Nos. 50-317/97-06, BG&E confirmed that Patuxent River Complex aircraft posed no safety hazard to the power station. BG&E is also conferring with us in their own EIS, which they are undertaking as part of their power station re-licensing application.

Recently, we also learned from BG&E that the power plant's critical containment vessels were designed and built to withstand natural disasters, as well as the impact of a crash from a fully laden, fully fueled Boeing 707 airplane. The vast majority of aircraft tested at Patuxent River are considerably smaller than a Boeing 707.

The Navy has tested prototype aircraft at Patuxent River since the mid 1940s. The types of test flights flown today and anticipated for the future are very similar to the test flights we conducted during the decades of the 1970s and 1980s. The main difference today is the extensive use of computer simulation and specialized ground test facilities prior to flight test. This approach has led to fewer flights and improved flight safety records. In fact, the annual flight hour rates for the 1970s and early 1980s were in excess of 30,000 flight hours per year, considerably higher than the preferred Alternative III of 24,400 flight hours per year. Because we use these new technologies and improved flight test techniques, our flight safety record for the decade of the 1990s is significantly better than the records from the 1970s and 1980s.

F-2

The Military Training Routes (MTRs) referred to in Dr. Mazetis' letter are not part of the Patuxent River Complex. The MTRs are established and controlled by the U.S. Air Force and are available for all military services to use. Any changes to the MTRs would have to come from the U.S. Air Force and the Federal Aviation Agency.

I hope you find this information helpful in responding to Dr. Mazetis' letter. I would welcome an opportunity to meet with you or your staff to discuss these issues in more detail.

Sincerely,

TIMOTHY S. SMITH
Executive Director

Enclosures: CTR Map

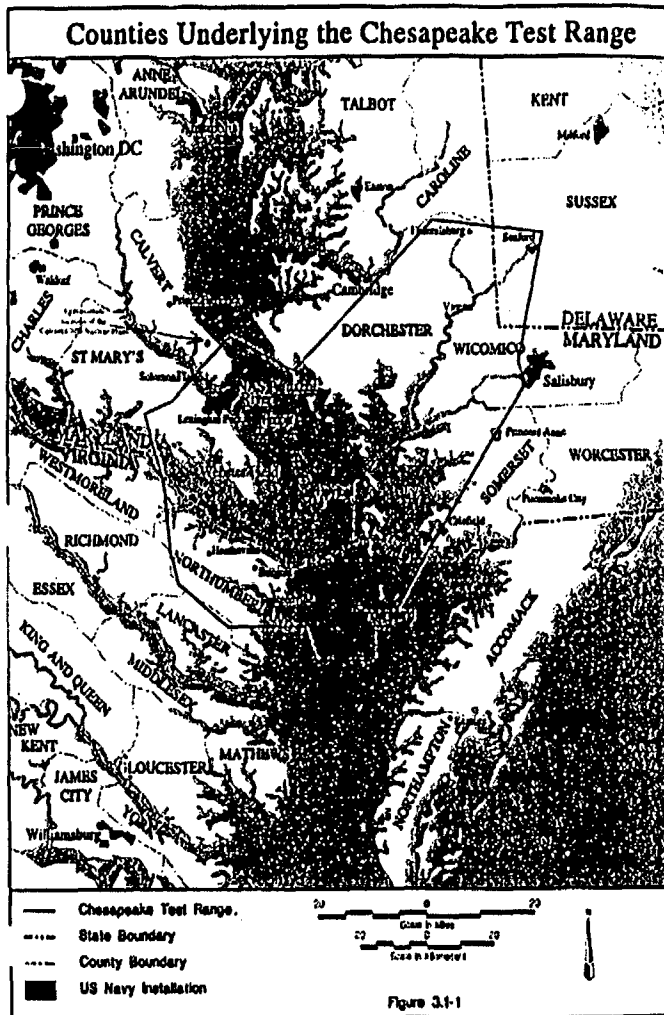
Copy to: Chief, Rules Review and Directives Branch, NRC
Hon. Steny Hoyer, House of Representatives
Cdr. Michael Waters, Office of Legislative Affairs

F-3

October 1999

A-126

NUREG-1437, Supplement 1



F-4

LETTER G

LS09

C. C. 04

T. H. 04

From: "sheldon samuels" <sheljean@olg.com>
 To: OWFN_DO.owf2_po(CCEIS)
 Date: Fri, Apr 2, 1999 11:24 AM
 Subject: Supplement to prior comments

To: David B. Matthews
 From: SW Samuels
 VP for Policy Studies
 The Ramazzini Institute
 Re: Supplement to prior comments on the draft SEIS

Since submitting by e-mail on March 8 my comments on your draft, the nation's press seems to have finally picked up the information on fuel cells as an alternate source of stationary power production noted in my comments for the last hearing and on this round. I refer specifically to the story web posted 4/1/99 on cnn.com : FUEL CELLS COULD REVOLUTIONIZE U.S. POWER SUPPLY. I suggest that the writer of the section of the report on alternate sources read it, since it appears that the information available to him/her from DOE's fuel cell program is too difficult to access.

G, A.1.15

The news story makes a point I have neglected, i.e., the reduced need for a distribution grid. I am sure you understand what this means. Energy production in a gridless system adds 30% to energy production efficiency. There are costs associated with this displacement that militate against further investment in nuclear power plants, i.e., the increased cost of depreciation and lost investment and massive displacement of workers from their jobs associated with disorderly withdrawal from the market. In assessing the economic impact of relicensing, these calculations by your staff should be included in the final statement.

Please insert this comment in the record of the hearing.

G-1

LETTER H

PS 89
C. Romero
T. Henry
 From: <Treromos@aol.com>
 To: OWFN_DO.owf2_po(CCEIS)
 Date: Fri, Apr 9, 1999 10:43 PM
 Subject: Do not extend application of BGE - Calvert Cliff Nuclear Power Plant

Chief
 Rules and Directives Branch
 Division of Administrative Services
 Mailstop T-6D 59
 U.S. Nuclear Regulatory Commission
 Washington, D.C. 20555

I do not support a license extension application of BGE for its Calvert Cliffs Nuclear Power Plant to operate another twenty years, at the Holiday Inn at Solomon's Island, Maryland.

1. We not have the solution for nuclear waste.
2. There are more efficient electric appliances.
3. As a society we must look for alternative energy.....plan waste, recycle and stop usage.

Leo R Romo
 3545 Christy Way
 Saginaw, MI 49603
 e-mail treromos@aol.com

H-1

LETTER I

PS 89
C. Romero
T. Henry
 From: Barbara Larcom <larcom@bcpl.net>
 To: OWFN_DO.owf2_po(CCEIS)
 Date: Sat, Apr 10, 1999 9:39 AM
 Subject: Calvert Cliffs License Renewal

3015 Keswick Road
 Baltimore, MD 21211
 April 10, 1999

Chief
 Rules and Directives Branch
 Division of Administrative Services
 Mailstop T-6D 59
 U.S. Nuclear Regulatory Commission
 Washington, D.C. 20555

Dear Chief, Rules and Directives Branch:

I have belatedly learned of the second public hearing, held on Tuesday, April 6, pursuant to BGE's application to extend its license for the Calvert Cliffs Nuclear Power Plant. The license extension would allow BGE to operate at Calvert Cliffs for another twenty years. I understand that citizens have until May 20, 1999 to submit written statements to the NRC. This letter to you is my statement, to be submitted into the record.

I am strongly opposed to the renewal of the license for Calvert Cliffs. As we have seen in Three Mile Island, Chernobyl, and elsewhere, the risks of nuclear power far outweigh the benefits. I feel uneasy living anywhere near Calvert Cliffs. Please just shut it down.

Thank you for your attention to and consideration of my opinion.

Sincerely yours,

Barbara Larcom

I-1

H, A.1.2

I, A.1.2

LETTER J

CS 09
C. CR419
J. Keenan

From: Joseph Byrne <josephb@quixote.org>
To: OWFN_DO.owf2_po(CCEIS)
Date: Mon, Apr 12, 1999 7:01 PM
Subject: no to renewal of Calvert Cliffs

Dear Friend:

The time has come to seriously seek renewable and safe sources of energy. Nuclear energy is neither. I do not feel safe living in Maryland while the crumbling Calvert Cliffs plant is still up and running. I urge you to not renew Calvert Cliff's license and shut it down as soon as possible, for the sake of all of us, particularly our children and their children.

--

Joseph Byrne
 Quixote Center
 tel: 301-699-0042
 fax: 301-864-2182
 josephb@quixote.org
 "I offer you a lotus, buddha-to-be..."

J-1

LETTER K

UNION OF
 CONCERNED
 SCIENTISTS

April 12, 1999

Chief - Rules Review and Directives Branch
 Division of Administrative Services
 Mailstop T-6D-59
 United States Nuclear Regulatory Commission
 Washington, DC 20555-0001

SUBJECT: COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR CALVERT CLIFFS LICENSE RENEWAL APPLICATION

Good Day:

In accordance with the guidance contained in NRC Press Release No. 1-99-22, dated March 30, 1999, the Union of Concerned Scientists (UCS) respectfully submits written comments on the draft environmental impact statement (NUREG-1447 Supplement 1) for the Calvert Cliffs license renewal application. These written comments supplement the oral comments provided during the public meeting conducted by the NRC staff on April 6, 1999, in Solomons, Maryland.

1. The draft supplement environmental impact statement (SEIS) appears unfairly biased. For example, page 6-4 of the draft SEIS states, "... in accordance with Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site..."

In section 8.2.4.7, the draft SEIS states, "None of these technologies [biomass-derived fuels] have progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as CCNPP." Other renewable energy technologies are comparably dismissed in Section 8.2.4 of the draft SEIS.

On one hand, the draft SEIS gives full credit to one uncertain and unproven technology (i.e., disposal of high level nuclear waste). Nuclear utilities have filed suit against the Department of Energy for breach of contract related to overdue acceptance of high level nuclear waste. That lawsuit clearly suggests some doubt regarding the reliability of a repository. On the other hand, the draft SEIS tosses aside renewable technologies because their development has not progressed enough to be reliable at this time, even though the Calvert Cliffs' licenses do not expire until July 31, 2014, and August 13, 2016. The draft SEIS apparently presumes that the repository will someday become available but that renewable technologies will not. Thus, the draft SEIS appears to apply separate standards to favor nuclear power and penalize alternatives. Such inequitable treatment must be removed from the final report.

K-1

K1, A.1.3

The draft SEIS fails to properly consider the potential impact on human health from radioactive releases during normal plant operation. Section 4.1.2 of the draft SEIS discusses the impacts of routine plant operation on fish and shellfish, reporting that "...approximately 1,600,000 finfish and blue crabs would be collected on the traveling screens, 260,000 would die..."

Section 4.3 of the draft SEIS discusses the potential impact on human health from radioactive material released during normal plant operation. On page 4-16, the draft SEIS states, "No significant new information has been identified by the staff in the review process and in the staff's independent review."

During the public meeting on April 6th, I asked Mary Ann Parkhurst, Staff Scientist at the Pacific Northwest National Laboratory and the NRC representative presenting this portion of the SEIS, why impacts on fish and shellfish were discussed in detail while radiation impacts on human health were not detailed. She replied that such an evaluation was outside the scope of the environmental reviews.

In his book *The Enemy Within* (Four Walls Eight Windows, New York, 1996), Jay M. Gould reported that the white female breast cancer mortality rates for Calvert and Prince Georges Counties are approximately 15% higher ~~since~~ the Calvert Cliffs Nuclear Power Plant began operating.

During the public meeting on April 6th, Dr. David Rogers, health official for Calvert County, reported that unpublished data from a cancer incidence registry maintained by the State of Maryland since 1992 shows no discernable increase in cancer rates for the three southernmost counties in Maryland compared to the state and national averages.

U.S. does not have the expertise to independently determine whether radiological releases from the Calvert Cliffs plant have had adverse public health consequences. Gould's book suggests there may be a link. The unpublished data cited by Dr. Rogers suggests otherwise, although the creation of the registry in 1992 prevents any before after conclusions to be drawn from this data.

In any case, the draft SEIS fails to seriously address this matter. The draft SEIS goes into considerable detail when evaluating the impact of plant operation on fish and shellfish populations. The draft SEIS, at best, evaluates potential impacts of plant operation on human populations superficially.

When nuclear power plants were initially licensed, the NRC made an assumption that the various regulations governing routine releases of radioactive materials provided adequate protection of public health. Since Calvert Cliffs is the first nuclear power plant to seek license renewal, it would seem responsible for the NRC to ensure that its original assumption is valid. An environmental impact statement with considerably less attention paid to potential human health consequences from routine radiation releases than from impingement of fish and shellfish is totally inconsistent with the NRC's federal mandate to protect public health and safety.

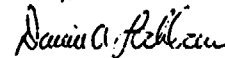
The final report must include a detailed assessment of potential health effects from routine radiation releases. This assessment should be a plant-specific evaluation and not a mere repackaging of past generic studies.

If detailed assessments of potential health effects from routine radiation releases from the Calvert Cliffs plant and from at least two (2) other sites seeking license renewal confirm the NRC's

K2,
A.1.3,
A.1.6

assumption, then it might be unnecessary to conduct this effort for subsequent license renewal applications. Until that time, it would be imprudent for the NRC to grant a 20-year extension to any nuclear power plant operating license.

Sincerely,



David A. Lochbaum
Nuclear Safety Engineer

K-2

K-3

October 1999

A-130

NUREG-1437, Supplement 1

LETTER L

DSO9
C. Craig
T. Kenyon

To: Chief

Rules Review and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

From: Robin Mills

Director, Maryland Safe Energy Coalition
1443 Gorsuch Avenue
Baltimore, Maryland 21218
Phone # (410) 662-8483 Fax # (410) 235-5325
E-mail: rmills4@bcpl.net POBox #33111, Balt. 21218

Re: written comments on NUREG-1437, "Generic Environmental
Impact Statement for License Renewal of Nuclear Plants,"
Supplement 1, Calvert Cliffs Nuclear Power Plant
Date: May 4th, 1999

Dear regulators,

My contention is that license renewal should be denied.

Point 1.

Baltimore Gas and Electric Company, now known as
Constellation Energy Group (CEG), has failed to justify
need for the proposed action. Page xlii, line 33 of the
GEIS states "...to meet future generating needs, as such
needs may be determined by state, utility, and, where
authorized, Federal (other than NRC) decisionmakers."
CEG has totally failed to justify need for this action.
The current license is good for fifteen more years. The
need for electric generating capacity at that time is
unknown and depends on factors such as conservation of
energy, new sources and what will happen as a result of
utility deregulation. I ask that license renewal be denied
until the year 2009, when need for the proposed action can
be better assessed.

L1, A.1.3

L-1

Point 2.

Page 5-3, line 38 of the GEIS puts the Core Damage
Frequency at 3.3×10^{-4} per reactor year. Since the company
has two reactors, and license extension is for 20 years:
 $.00033 \times 2 \text{ reactors} \times 20 \text{ years} = \text{one chance in 75 a core damaged}$
when the CCNPP was initially licensed the people agreed to
a certain risk for a defined amount of time. I argue that
license extension breaks this written promise made 25 years
ago by increasing the risk to the public, shareholders and
company beyond that originally agreed to. The damage to
GPU after the Three Mile Island core meltdown is used as
reference. One chance in 75 that such an accident might occur
is simply unacceptable to all stakeholders. I ask that
license renewal be denied as long as it represents this
unacceptably high level of risk.

L2, A.1.10

Point 3.

Page 6-25, line 25 thru 27 states that energy management
is not a possible replacement for CCNPP electricity. This
is a lie, and I ask that this statement be struck from the
EIS. It is a lie, because currently available energy
conservation technology can replace CCNPP electricity
several fold over, and because technology advances over
the next 15 years are unknowable to make such a statement,
and because utility deregulation means other electricity
providers may replace CCNPP power with cheaper alternatives.
Conservation would also be much cheaper than license renewal.
At a minimum, license renewal should be delayed until 2009
so that a projection of demand during the extended license
period can have some credibility.

L3, A.1.15

Point 4.

The license renewal process is illegitimate because
the nuclear waste created over the license renewal period
has been excluded from the process. This is a matter so
important that the court system may have to resolve it.
Excluding that nuclear waste from consideration in the EIS
shows bias, industry favoritism, is uncalled for, and

L4, A.1.3

L-2

Appendix A

will be the eventual downfall of the entire process. I demand consideration of the addition of 20 years of spent fuel creation and storage be included in the license renewal process. I specifically object to page 2-24, lines 24 and 25 of the EIS. The accumulation of activation products in the materials of the containment building must increase over the life cycle of reactor operations, therefore the statement that exposures will not increase in a life and must be removed from the EIS. Exposures will increase to workers entering the containment building as surely as the sun rises every day. Furthermore, the likelihood that repairs will be needed inside the containment building will also rise as plant equipment ages. This dual effect means much higher exposures for the workforce. Point 5.

CEG seeks to operate CCNPP for 60 years. No nuclear power plant anywhere in the world has operated for more than 35 years. Because of the non-existent historical record for extended operations, the license extension should be labeled as an experiment, with special provisions for extended license revocation should unexpected aging related problems arise. The experimental nature of license extension warrants special caution, by our federal regulators in whom we trust. Thus, what I ask, is that the operating license given for CCNPP not be identical to the original operating license, but that it be somewhat more restrictive, especially regarding aging related and maintenance matters which might more seriously effect an older nuclear plant.

Point 6.

Vertical tendons inside the containment building have been suffering unexpectedly high rates of brittle fracture failure. In a letter to me dated 8 February 1999 on this subject I read about how CEG engineers are fixing this problem inside the containment building. I quote from Nuclear Reactor Engineering, by Samuel Glasstone and Alexander Sesonske, 1994, page 433, section 7.77, sentence 1, "As with metals in general, exposure to radiation causes hardening and embrittlement of stainless steel."

L5,
A.1.6

L6,
A.1.12

L7,
A.1.12

L-3

This neutron induced embrittlement problem is widely known and acknowledged, and as such should be a matter of intense scrutiny in the EIS. I contend that this problem alone should rule out any license extension as being too dangerous an increase in risk to the reactor and as a possible accident initiator. Accidents do cause environmental impacts.

Point 7.

Again I quote from Nuclear Reactor Engineering, page 434, section 7.70, second sentence, "However, there is a possibility that accident sequences leading to the injection of emergency coolant water would result in combinations of vessel temperatures with thermal and pressure stresses that could lead to catastrophic vessel fracture." and on the same page is the statement, "The feasibility of the lifetime extension may indeed depend upon the NDT temperature margin available." The NDT (Non-ductility Transition) temperature rises very slightly every year CCNPP operates. Considering the potential severity of an accident with catastrophic vessel failure, and the above quoted expert opinion on the subject, I request a special section with detailed analysis on this specific problem and the unique additional risk it entails to extended operation be included in the final EIS before any license extension is granted.

Point 8.

The NRC's LOCFR50, app.H concerns the reactor vessel material surveillance program. At the public hearing in Solomons, Maryland, I asked about those samples, and was told that there are currently only two samples remaining. I request that data concerning the results of the tests done on the first three samples be included in the final EIS, and data from the generic trend curves in regulatory guide 1.99 regarding NDT trends all be included in the final EIS so that the public has a better idea of the risk involved in extended operation to the unreplaceable reactor pressure vessel. I withdraw this request if CEG plans to replace the reactor pressure vessel.

L8,
A.1.12

L9,
A.1.12

L-4

October 1999

A-132

NUREG-1437, Supplement 1

Point 9.

In a document dated 19 March 1999, re a summary of the February 10, 1999 meeting between BG&E and NRC over the issue of CCNPP license extension, there is an unnumbered page within enclosure 2 titled System-Specific ARDI Issues that I find fault with. The quote is, "For all of these systems EXCEPT the RCS, the licensee uses ARDIs to confirm effectiveness of chemistry controls."

Using chemistry controls alone on the Reactor Control System is not acceptable. Not only is this system subject to age related degradation problems (ARD), but it is in a high radiation field subjecting the system to neutron embrittlement concerns, and the system is a primary safety system which has no backup!!! If the CRUM fail, how do you plan to shutdown? Should parts break inside causing jamming then chemistry controls will not discover the problem. A physical inspection should be required for this system. Due to the high level of radiation, remotely controlled cameras should be used to limit personnel exposures, and that procedure is probably good enough to certify that the RCS system is OK.

End.

cc: NRC

Sen. Paul Sarbanes
Sen. Barbara Mikulski
Paul Gunter, NIRS

L-5

LETTER M

CHARLES H. CRUSE
Vice President
Nuclear Energy

RECEIVED

1999 APR 29 PM 4:07

RULES & DIR. BRANCH
US NRC

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410-495-4455

April 27, 1999

BGE

DS09
C. Cruse
T. Kenyon

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Rules and Directives Branch
Office of Administration

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Comments on Draft NUREG-1437, Volume 1, Addendum 1, "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"

REFERENCE: (a) Federal Register Notice 64FR9444, dated February 26, 1999, "Changes
to Requirements for Environmental Review for Renewal of Nuclear
Power Plant Operating Licenses; Availability of Supplemental
Environmental Impact Statement; Proposed Rule and Notice

In response to the Reference (a), Baltimore Gas and Electric Company is pleased to provide comments on the subject draft addendum to NUREG-1437, Volume 1. Baltimore Gas and Electric Company participated in developing the comments provided by the Nuclear Energy Institute in their letter dated April 27, 1999, and fully endorses those comments.

M, A.1.16

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,

CHC
for
C. H. Cruse
Vice President - Nuclear Energy

CHC/RCG/bjd

cc: Document Control Desk, NRC
R. S. Fleishman, Esquire
J. E. Silberg, Esquire
S. S. Bajwa, NRC
A. W. Thompson, NRC

H. J. Miller, NRC
Resident Inspector, NRC
R. I. McLean, DNR
J. H. Walter, PSC

M-1

Appendix A

LETTER N

DS09
C. Craig J. Kenyon
 From: JOEL STAHL <JOELSTAHL@webtv.net>
 To: OWFN_DO.owf2_po(CCEIS)
 Date: Tue, May 11, 1999 8:40 AM
 Subject: RADIO ACTIVE MATERIALS

FOR INFORMATION ON SAFE SECURE LOW-COST INTERIM STORAGE FOR PLUTONIUM N, A.1.16
 AND NUCLEAR WASTE VISIT www.nukewaste.com WILL BE GLAD TO DISCUSS.
 JOEL S. STAHL

www.plutoniumstorage.com
www.nukewaste.com

N-1

LETTER O

DS09
J. Kenyon
 8 May 1999
 Chief, Rules and Directives Branch
 Division of Administrative Services
 Mailstop T-6D-69
 U.S. Nuclear Regulatory Commission
 Washington, DC 20555-0001

RECEIVED

1999 MAY 12 PM 3:39

RULES & DIR. BRANCH
US NRC

Dear Sir:

These comments are on the Nuclear Regulatory Commission (NRC) draft environmental impact statement for Baltimore Gas & Electric (BG&E) Company Calvert Cliffs Nuclear Power Plant license renewal application. Per the NRC Public Affairs notice of 30 March 1999, public comments may be taken through 20 May 1999. BG&E or its affiliates do not employ me, nor do I work in the power generation business.

I believe the Calvert Cliffs Nuclear Power Plant (CCNPP) is beneficial to the BG&E service area, and to the Mid-Atlantic region, and as such should have its license renewed for CCNPP Units One and Two. The plant produces clean power without the detrimental emissions that would be produced by equivalent 850-megawatt fossil-fuel burning units.

O, A.1.1

The draft environmental report posted on your agency's web site reported no environmental reasons to preclude the award of a renewed license. Further, review of NRC inspection reports; again from documents at your site, found the plant in good shape and being well maintained. Since the NRC constantly monitors the condition of the CCNPP and has the authority to cutback or stop power production in case of problems, there is minimal concern of a significant radiation release. My family and I live within 40 miles of the Calvert Cliffs in Anne Arundel County and have no concerns as to our safety from the operation of the nuclear power plant.

BG&E appear to be taking prudent management steps to insure the license will be there to justify a major investment in new boilers. It is also not lost on me that this is a precedent-setting license renewal request. My view is that nuclear power, properly regulated, is one of the better ways to prevent the introduction of greenhouse gases and particulate pollution into our air.

As a BG&E ratepayer and local area resident, I support the renewal of the operating license for both units of the Calvert Cliffs Nuclear Power Plant.

Sincerely,



Keith R. McAllister
 727 Shiloh Court
 Davidsonville, MD 21035

O-1

October 1999

A-134

NUREG-1437, Supplement 1

LETTER P



DS09

T. Kenyon

Department of Energy

Washington, DC 20585

May 18, 1999

RECEIVED

1999 MAY 20 PM 3:54

RULES & DIR. BRANCH
US NRC

Chief
Rules Review and Directives Branch
Division of Administrative Services
Mailstop T6D59
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: COMMENTS ON NUREG-1437, SUPPLEMENT 1

Dear Sir:

In its *Generic Environmental Impact Statement for Renewal of Nuclear Plants (GEIS)*, NUREG-1437, the U.S. Nuclear Regulatory Commission (NRC) considered the environmental effects of renewing nuclear power plant operating licenses for a 20-year period. The GEIS identified generic as well as plant-specific environmental issues, including those associated with transportation of spent nuclear fuel. At the time NUREG-1437 was issued, the NRC stated its intent to conduct plant-specific reviews, the results of which were to be included in supplements to the GEIS.

On February 26, 1999, the NRC issued a Notice in the *Federal Register* requesting public comments on Supplement 1 to NUREG-1437, which specifically applies to the Baltimore Gas & Electric Company's application for license renewal for the Calvert Cliffs Nuclear Power Plant, Units 1 and 2. The Department of Energy's Office of Civilian Radioactive Waste Management (OCRWM) has reviewed NUREG-1437, Supplement 1, and offers this general observation.

OCRWM's ongoing transportation assessments are based on assumptions that may, in some cases, be more detailed than those made by NRC. For example, we plan to assume Nevada-specific accident rates for assessing radiological accident risks rather than the national average; our risk assessments typically are based on regulatory maximum exposures rather than lower nominal exposures that are consistent with cask designs; and we plan to consider doses to state inspectors or escorts.

P-1

Although the assumptions in our transportation risk assessments may differ slightly from those made by the NRC, the results of our assessments appear to be consistent with the NRC's conclusion in NUREG-1437, which states that:

"radiological and accident risks of SNF transport in the vicinity of Las Vegas are within regulatory limits and small."

Should you have any questions concerning our comments, please feel free to contact Nancy Slater of my staff at 202/586-9322.

Sincerely,

Alan B. Brownstein, Director
Regulatory Coordination Division
Office of Civilian Radioactive
Waste Management

cc:

R. Loux, State of Nevada
J. Hoffman, State of Nevada
R. Price, NV Legislative Committee, NV
J. Meder, NV Legislative Counsel Bureau, NV
M. Murphy, Nye County, NV
N. Stellavato, Nye County, NV
M. Baughman, Lincoln County, NV
D. Bechtel, Clark County, NV
B. Mettam, Inyo County, CA
V. Poe, Mineral County, NV
W. Cameron, White Pine county, NV
T. Manzoni, Lander County, NV
L. Fiorenzi, Eureka County, NV
E. von Tiesenhausen, Clark County, NV
J. Regan, Churchill County, NV
L. Bradshaw, Nye County, NV
W. Barnard, NWTRB, Washington, DC
R. Holden, NCAI
A. Collins, NIEC
R. Arnold, Pahrump County, NV
S. Kraft, NEI
S. Frishman, Agency for Nuclear Projects, NV
D. Dudley, Esmeralda County, NV
E. Culverwell, Lincoln County, NV
J. Wallis, Mineral County, NV

P-2

Appendix A

P, A.1.16

J. Groves, NRC
 W. Barnard, NWTRB
 S. Broccom, YMPO
 R. Clark, YMSCO
 R. Dyer, YMPO
 A. Gil, YMPO
 D. Horton, YMPO
 L. Barrett, DOE, HQ
 S. Hanauer, DOE, HQ
 D. Shelor, DOE, HQ
 A. Brownstein, DOE, HQ
 C. Einberg, DOE, HQ
 N. Slater, DOE, HQ

P-3

LETTER Q

DS09
 T. Kenyon



RECEIVED
 1999 MAY 20 PM 3:43
 RULES & DIR. BRANCH
 US NRC

Paul H. Glendening
 Governor
 Kathleen Kennedy Townsend
 Lt. Governor

Maryland Department of Natural Resources
 POWER PLANT ASSESSMENT DIVISION
 Tyson State Office Building, B-3
 Annapolis, Maryland 21401-3397

John R. Griffin
 Secretary
 Stanley K. Arthur
 Deputy Secretary

May 19, 1999

Chief
 Rules Review and Directives Branch
 Division of Administrative Services
 Mailstop T 6 D 59
 U.S. NRC
 Washington, DC 20555-0001

Dear Sir:

We have reviewed the draft document entitled *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Calvert Cliffs Nuclear Power Plant* (NUREG-1437, Supplement 1), and have prepared the attached comments on the document. On behalf of the State of Maryland, the Department of Natural Resources (DNR) Power Plant Research Program has been involved with various studies at the Calvert Cliffs Nuclear Power Plant (CCNPP) since the plant was commissioned in 1974. DNR has coordinated the involvement of Maryland state agencies throughout the CCNPP relicensing process, and has solicited feedback from them on this draft supplemental environmental impact statement (SEIS). Our comments on this document as provided below reflect our knowledge of CCNPP and of power station operations in general - fossil-fired as well as nuclear - and the input we have received from other Maryland agencies.

Based on 25 years of operational history with minimal impact to the State's natural resources, the State of Maryland concurs with Staff's conclusion that adverse environmental impacts of CCNPP license renewal are not so great that preserving the option of license renewal would be unreasonable. This letter presents information that may be useful to Staff in updating and finalizing the document. Our comments fall into the following categories: 1) fisheries valuation; 2) EMF research; 3) alternatives to license renewal; and 4) miscellaneous comments.

Q-1

Fisheries Valuation

Section 4.1.2 of the SEIS presents estimates of fisheries losses caused by impingement at CCNPP, including the monetary values of those losses (page 4-9). However, there are more up-to-date estimates of these losses that should be incorporated into the document. Attached to this letter, DNR is providing relevant summary tables with estimates of the value of fish killed from impingement at CCNPP in 1993, 1994 and 1995. The tables present the most common species impinged each year (the listed species account for 99% of the fish impinged). The estimated number of fish impinged as well as the estimated weights were obtained from the Academy of Natural Sciences annual impingement studies (references 1 - 3). BGE estimates of percent survival for impinged species were incorporated into the assessment.

Following the methods described in the draft SEIS, no value was estimated for species with survival rates greater than 99% (*Callinectes sapidus* and *Trinectes maculatus*). Because there were no known survival estimates for three species (*Morone americana*, *Morone saxatilis*, and *Cynoscion regalis*), our percent survival for these species was estimated to be the mean survival of other species impinged that year (78% for *M. americana* and *M. saxatilis*, 82% for *C. regalis*).

Valuation of individual species involved two sources: The first set of tables uses American Fisheries Society (reference 4) valuation factors (attachment 1), while the second set (attachment 2) uses factors established in the Code of Maryland Regulations (references 5,6) and an inflated dollar value (1993, 1994, 1995) based upon the consumer price index (CPI). When the COMAR value varied with size of fish, an estimate of likely mean size was developed by comparing the approximate weight per fish (from the estimated weight and number of fish of each species per unit per year) to known size weight relationships. The assumptions in this valuation are believed to be conservative, thereby potentially overestimating the value of fish killed each year.

Using these updated impingement data and valuation methods, it appears that the draft SEIS actually overstates the monetary value of impingement losses. We concur with Staff's conclusion that potential impacts of the cooling water intake system on the impingement of fish and shellfish are small, and mitigation is not warranted.

Electric and Magnetic Fields (EMF) Research

We concur with Staff's conclusion in Section 4.2.2 that epidemiological and experimental evidence regarding the chronic health effects of exposure to electric and magnetic fields (EMF) is inconclusive. For your information, the Maryland Power Plant Research Program also prepares summary reports of scientific evidence concerning the possible adverse health effects from EMF produced by electric power lines. In our latest report, the State of Maryland concludes that "scientists have been unable to develop a consensus that there is a definite link between EMF exposure and adverse public health" (reference 7). Maryland continues to monitor and study the results of EMF research.

Q1, A.1.5

Alternatives to License Renewal

Important changes affecting Maryland's electric power industry have taken place since preparation of the draft SEIS began. While these changes do not change the fundamental conclusions in the report, they serve as important background for inclusion in the SEIS and are briefly described in the following paragraphs.

In April 1999, the Maryland General Assembly approved the Electric Customer Choice and Competition Act of 1999, signed into law by Governor Glendening shortly thereafter. During the past year, BGE and other parties (including Maryland DNR) have been litigating a transition to retail competition. While that case is not yet concluded, it now appears likely that CCNPP will be transferred to an unregulated affiliate. (BGE itself is now a subsidiary of the newly created holding company, Constellation Energy Group, an exempt holding company under the Public Utility Holding Company Act.) There is one exception to this likely arrangement. BGE, as a utility "wires company", will continue to remain responsible for the funding of decommissioning of the plant. This is an important change, because previously there had been consideration of retaining CCNPP (Maryland's sole nuclear power plant) as a regulated asset and deregulating only fossil/hydro capacity.

Restructuring means that CCNPP will no longer be required to serve its Maryland customers (except perhaps in the early years of restructuring when BGE retains a "default" or Standard Offer obligation). As a general matter, in a restructured world, CCNPP will serve the regional, mid-Atlantic market. However, due to transmission constraints for imports into Maryland, if the plant were to be retired, either some of the replacement capacity must be sited in Maryland, or transmission intertie transfer capacity must be expanded to allow more imports. Although Maryland would need either replacement capacity or expanded transmission capability if Calvert Cliffs is retired, the new resources need not be sited in Southern Maryland (i.e., near the present Calvert Cliffs' site). This is because there is already substantial generation in Southern Maryland at Potomac Electric Power Company's (PEPCO) Morgantown and Chalk Point Plants. Maryland load centers are primarily north of the Calvert Cliffs site. Ultimately the retirement of Calvert Cliffs will necessitate replacement resources in the form of new generation and/or transmission in Maryland; it will be supplied by the market, not necessarily BGE.¹

There is another issue referenced on page 8-2 of the SEIS which requires update. The report correctly notes the facility's importance to Calvert County as a source of property tax revenue. However, utility tax legislation enacted in the most recent session of the Maryland General Assembly sharply reduces (on a phase-in basis) property tax revenue from Maryland power

The SEIS partially recognizes this in referring to replacement resources that "BGE may not be the ultimate supplier of power." (page 8-1)

Q3, A.1.15

Q-2

Q-3

plants. CCNPP's property tax payments will decline over time by 60 percent. Moreover, restructuring and accounting write-offs could lead to further reductions in property taxes from the plant. Calvert County will receive some compensation from the State to cushion the property tax loss, but that compensation is unrelated to license renewal. In summary, the property tax benefit from the plant will in the future be dramatically smaller than at the present time.

The report mentions coal- and gas-fired plants as being the primary replacement resources if CCNPP were to be retired. This view is reasonable, although it is very difficult to make predictions on preferred technology extending to 2014 and beyond. Based on current economics, we would emphasize gas-fired over coal-fired generation as the most likely capacity replacement.

We have some observations on the air emissions analysis. The discussion of air emissions needs to recognize that a major new combustion facility in Maryland would have to acquire "offsets" for nitrogen oxides (NO_x) and allowances for sulfur dioxide (SO₂). Effectively, this means no significant net increase in emissions for those pollutants on a regional basis. In the case of natural gas, even the "moderate" impact in the SEIS may be an overstatement. On the other hand, the SEIS does not consider greenhouse gases (most notably, carbon dioxide) from the replacement fossil capacity, which are not subject to offsets (at this time). Replacement of CCNPP's capacity with a coal-fired plant at the same site would certainly have local impacts with respect to concentrations of NO_x, SO₂, particulate matter, carbon monoxide, mercury and other trace metals and organic compounds.

With respect to gas-fired generation, the SEIS correctly notes that combined cycle units are the technology of choice for most new capacity additions presently and for the foreseeable future. The analysis assumes that only a short pipeline spur would be needed to serve the site, and that plenty of spare capacity on the interstate pipeline is available. Since we are talking about the time period after 2014, and natural gas demands are growing rapidly, this is clearly an uncertainty. Also, importantly, there is no mention of the need at a major gas-fired facility for backup oil storage tanks and the impacts they might have.

The SEIS discusses conservation programs as a means of replacing CCNPP. The report notes that conservation efforts merely slow growth in demand rather than reducing it, and therefore cannot directly substitute for CCNPP's capacity. Since the SEIS was prepared, BGE (with the concurrence of the Maryland Public Service Commission, PSC) has eliminated nearly all of its ongoing conservation programs. Maryland's restructuring legislation requires that the PSC review the need for conservation programs according to certain criteria. The review will take place in consultation with the Maryland Energy Administration (MEA). The outcome of such a PSC review cannot be predicted at this time. The present outlook is that utility-sponsored conservation programs in the future will likely be smaller in scope than in the past.

With reduced utility efforts and investment in conservation programs, it is unclear whether market forces under a restructured environment will enhance or retard customer conservation

Q-4

efforts. However, to the extent restructuring leads to lower retail rates, this will encourage greater demand for electricity (price elasticity effects), thereby undermining or offsetting the possibility that conservation programs could substitute for or replace CCNPP.

Miscellaneous Comments

Q4, A.1.18

Page 1-3, line 24: The plant is located approximately 40 miles southeast of Washington, DC, not southwest as currently stated in the draft.

Page 1-7, line 22: NPDES stands for National Pollutant Discharge Elimination System, not "Pollution" as stated in the draft.

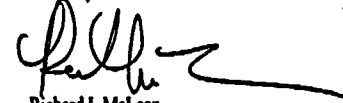
Page 6-7, lines 4 through 7: There appears to be a word or words missing from this sentence, which are needed to make it grammatically correct and complete.

Appendix D, Organizations Contacted: It would be more appropriate to refer to the overall Power Plant Research Program of DNR in this list of organizational contacts (i.e., on line 38 of page D-1, please delete the phrase "Transmission Programs").

* * *

We appreciate the opportunity to comment on the draft SEIS. The State of Maryland will continue to be actively involved in the characterization of natural resource impacts from life extension at CCNPP as this license renewal proceeds.

Sincerely,



Richard I. McLean
Manager, Nuclear Programs

RIM:nd

Q-5

ATTACHMENT 1

1993									
Species Name	No. Fish Unit 1	Estimated Weight (g)	No. Fish Unit 2	Estimated Weight (g)	Percent Survival	Total Fish Killed	Total Weight of Fish Kill	Value of Fish Kill	Value of Fish Kill
Anchoa mitchilli	82784	225368	323428	721555	0.64	133187.8	0.08 per fish	10655.03	
Brevoortia tyrannus	5636	417521	3329	518478	0.52	4308.2	0.2 per pound a	197.94	
Calinectes sapidus	353468	2936466	365732	27937212	0.99	NE			
Gobiosoma strumosus	2174	11101	538	2514	0.93	168.8	0.08 per fish b	15.19	
Leiostomus xanthurus	4601	74854	4076	59433	0.84	1368.3	0.11 per pound c	5.19	
Morone spp.	13874	131174	5041	49497	0.54	8700.9	0.08 per fish	696.07	
Micropterus undulatus	49403	748025	34	5066	0.19	40688.2	0.15 per pound c	15.62	
Syngnathus fuscus	8663	8281	4332	4307	0.85	2132.3	0.08 per fish b	170.56	
Trinectes maculatus	115023	2842983	71959	2141778	0.99	NE			11755.62
TOTAL VALUE OF 1993 FISH KILL									

1994									
Species Name	No. Fish Unit 1	Estimated Weight (g)	No. Fish Unit 2	Estimated Weight (g)	Percent Survival	Total Fish Killed	Total Weight of Fish Kill	Value of Fish Kill	Value of Fish Kill
Alepis ostreata	1255	80129	22931	147865	0.47	19549.8	0.32 per pound d	66.81	
Anchoa mitchilli	7445	18194	13810	34815	0.68	6633.8	0.08 per fish	546.89	
Calinectes sapidus	250584	12338166	297042	11384457	0.99	NE			
Gasterosteus aculeatus	1317	6260	2288	9308	0.91	324.5	0.08 per fish	25.96	
Leiostomus xanthurus	6602	537943	3520	166222	0.84	1819.5	0.11 per pound c	28.43	
Morone spp.	3105	23934	11345	88183	0.54	6647.0	0.08 per fish	531.76	
Morone americana *	365	2437	2078	25099	0.78	532.6	0.3 per pound	3.93	
Morone saxatilis *	297	33832	1473	62428	0.78	382.8	1 per pound	45.84	
Syngnathus fuscus	3004	3300	4423	4017	0.85	1114.1	0.08 per fish b	88.12	
Trinectes maculatus	18325	588346	21090	885403	0.99	NE			1271.74
TOTAL VALUE OF 1994 FISH KILL									

1995									
Species Name	No. Fish Unit 1	Estimated Weight (g)	No. Fish Unit 2	Estimated Weight (g)	Percent Survival	Total Fish Killed	Total Weight of Fish Kill	Value of Fish Kill	Value of Fish Kill
Alepis ostreata	2265	11839	1777	10802	0.47	2142.3	0.44 per pound d	11.62	
Anchoa mitchilli	74321	206486	78010	217284	0.68	48745.9	0.08 per fish	3889.87	
Calinectes sapidus	133430	7514383	107809	8404294	0.99	NE			
Cynoscion regalis *	3700	52429	1388	26671	0.82	908.6	0.11 per pound c	3.42	
Gobiosoma strumosus	2688	14575	1010	5180	0.93	259.8	0.08 per fish b	20.78	
Morone spp.	7191	52472	6177	47520	0.84	2138.9	0.08 per fish	171.11	
Syngnathus fuscus	5253	4975	3358	3180	0.85	1281.7	0.08 per fish b	103.33	
Trinectes maculatus	8246	249608	8620	254689	0.99	NE			4209.81
TOTAL VALUE OF 1995 FISH KILL									

NE - Not Estimated; fish mortality assumed to be negligible because survival rate is 99%

* - Percent survival estimated as mean of other known species.

a - Average size of 4-6 inches assumed for valuation purposes

b - Value assigned to forage fish.

c - Value for freshwater drum (the only Sciaenidae for which a value exists); average size 1.4 inches assumed for valuation purposes

d - Average size of 4 - 6 inches assumed for valuation purposes.

Q-6

ATTACHMENT 2

1993									
Species Name	No. Fish Unit 1	No. Fish Unit 2	Percent Survival	Total Fish Killed	Species Value in Dollars	Value Before Adjustment	COMAR Adjustment Factor	COMAR Value	Adjusting for CPI Increase (2.69)
Anchoa mitchilli	82784	323428	0.64	133187.8	1 per thousand	133.19	0.75	99.89	264.71
Brevoortia tyrannus	5636	3329	0.52	4308.2	0.1 each	430.92	1	430.92	1163.36
Calinectes sapidus	353468	365732	0.99	NE	0.25 each		1		
Gobiosoma strumosus	2174	538	0.93	168.8	1 per thousand	0.19	0.75	0.14	0.38
Leiostomus xanthurus	4601	4076	0.84	1368.3	0.15 each	204.25	0.8	166.60	448.15
Morone spp.	13874	5041	0.54	8700.9	1 per thousand	8.70	0.75	6.53	17.55
Micropterus undulatus	49403	34	0.19	40688.2	0.15 each	6009.03	1	6009.03	16164.26
Syngnathus fuscus	8663	4332	0.85	2132.3	1 per thousand	2.13	0.75	1.60	4.32
Trinectes maculatus	115023	71959	0.99	NE	1 per thousand		0.75		
TOTAL VALUE OF 1993 FISH KILL									8725.70 16086.75

1994									
Species Name	No. Fish Unit 1	No. Fish Unit 2	Percent Survival	Total Fish Killed	Species Value in Dollars	Value Before Adjustment	COMAR Adjustment Factor	COMAR Value	Adjusting for CPI Increase (2.75)
Alepis ostreata	1255	22931	0.47	19549.8	0.1 each	1954.98	1	1954.98	5378.13
Anchoa mitchilli	7445	13810	0.68	6633.8	1 per thousand	6.63	0.75	5.13	14.08
Calinectes sapidus	250584	297042	0.99	NE	0.25 each		1		
Gasterosteus aculeatus	1317	2288	0.91	324.5	1 per thousand	0.32	0.75	0.24	0.67
Leiostomus xanthurus	6602	3520	0.84	1819.5	0.15 each	242.93	0.8	194.34	534.46
Morone spp.	3105	11345	0.54	6647.0	1 per thousand	6.65	0.75	4.99	13.71
Morone americana *	365	2078	0.78	532.6	0.15 each	79.89	1	79.89	219.71
Morone saxatilis *	297	1473	0.78	382.8	0.75 each	287.07	1	287.87	789.45
Syngnathus fuscus	3004	4423	0.85	1114.1	1 per thousand	1.11	0.75	0.84	2.30
Trinectes maculatus	18325	21090	0.99	NE	1 per thousand		0.75		
TOTAL VALUE OF 1994 FISH KILL									2577.48 6950.53

1995									
Species Name	No. Fish Unit 1	No. Fish Unit 2	Percent Survival	Total Fish Killed	Species Value in Dollars	Value Before Adjustment	COMAR Adjustment Factor	COMAR Value	Adjusting for CPI Increase (2.83)
Alepis ostreata	2265	1777	0.47	2142.3	0.1 each	214.23	1	214.23	606.78
Anchoa mitchilli	74321	78010	0.68	48745.9	1 per thousand	48.75	0.75	36.56	100.46
Calinectes sapidus	133430	107809	0.99	NE	0.25 each		1		
Cynoscion regalis *	3700	1388	0.82	908.6	0.25 each	227.14	1	227.14	642.81
Gobiosoma strumosus	2688	1010	0.93	259.8	1 per thousand	0.26	0.75	0.19	0.56
Morone spp.	7191	6177	0.84	2138.9	1 per thousand	2.14	0.75	1.60	4.51
Syngnathus fuscus	5253	3358	0.85	1281.7	1 per thousand	1.29	0.75	0.97	2.74
Trinectes maculatus	8246	8620	0.99	NE	1 per thousand		0.75		
TOTAL VALUE OF 1995 FISH KILL									680.70 1360.37

* - Percent survival estimated as mean of other known species

NE - Species with known employment survival of 99% were omitted from evaluation

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REFERENCES

- 1) Hixson, J.H. III and D.L. Breitburg. 1993. 1993 Impingement Studies at Calvert Cliffs Nuclear Power Plant for Baltimore Gas and Electric Company. Estuarine Research Center, St. Leonard, Maryland, of The Academy of Natural Sciences, Philadelphia, Pennsylvania. Report No. 94-28.
- 2) Hixson, J.H. III and D.L. Breitburg. 1994. 1994 Impingement Studies at Calvert Cliffs Nuclear Power Plant for Baltimore Gas and Electric Company. Estuarine Research Center, St. Leonard, Maryland, of The Academy of Natural Sciences, Philadelphia, Pennsylvania. Report No. 95-13.
- 3) Hixson, J.H. III and D.L. Breitburg. 1995. 1995 Impingement Studies at Calvert Cliffs Nuclear Power Plant for Baltimore Gas and Electric Company. Estuarine Research Center, St. Leonard, Maryland, of The Academy of Natural Sciences, Philadelphia, Pennsylvania. Report No. 96-12.
- 4) American Fisheries Society. 1992. Investigation and valuation of fish kills. American Fisheries Society Special Publication 24. Bethesda, Maryland.
- 5) COMAR Title 08, Subtitle 02, Chapter 09, Section 01 - Monetary Value of Tidal Water and Non-tidal Water Aquatic Animals.
- 6) COMAR Title 26, Subtitle 08, Chapter 03, Section 05 - Cooling Water Intake Structures.
- 7) Patty, S. 1999. Status Report on Potential Human Health Effects Associated with Power Frequency Electric and Magnetic Fields. Maryland Power Plant Research Program. Report No. PPSE-T-42

Q-8

LETTER R

DS09
T. WrayCHARLES F. CRANE
Vice President
Nuclear EnergyRECEIVED
1999 MAY 24 PM 4:00
RULES & DIRECTIVES
US NRCBaltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 495-4455

BGE

May 19, 1999

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Chief, Rules and Directives Branch

SUBJECT: Calvert Cliffs Nuclear Power Plant
Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for License
Renewal of Nuclear Plants (64 FR 11071)

Baltimore Gas and Electric Company (BGE) appreciates the opportunity to comment on the draft supplement to NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants, as requested in the Federal Register notice published on March 8, 1999 (64 FR 11071). The draft supplemental environmental impact statement (SEIS) was prepared in response to BGE's application to renew the operating licenses for Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 1 and Unit 2 for an additional 20 years under 10 CFR Part 54.

Baltimore Gas and Electric Company agrees with the approach taken by the Nuclear Regulatory Commission (NRC) to evaluate the environmental impacts of extending CCNPP's operating licenses, as well as the conclusions reached by the NRC relative to these impacts. We do, however, have comments that are intended to clarify, and in some cases, correct the information presented in the draft SEIS. These comments are provided as Attachment 1 to this letter. Baltimore Gas and Electric Company is satisfied that these comments will not effect the NRC staff's preliminary recommendation regarding the renewal of CCNPP's operating licenses.

Should you have questions regarding this matter, we will be pleased to discuss them with you.

Very truly yours,



CHC/RCG/dlm

Attachment: (1) Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for License
Renewal of Nuclear Plants

R-1

R,
A.1.4,
A.1.8,
A.1.16,
A.1.17,
A.1.18
Table A-2

October 1999

A-140

NUREG-1437, Supplement 1

Document Control Desk
May 19, 1999
Page 2

cc: R. S. Fleishman, Esquire
J. E. Silberg, Esquire
S. S. Bajwa, NRC
A. W. Dromerick, NRC
H. J. Miller, NRC

Resident Inspector, NRC
C. I. Grimes, NRC
T. Kenyon, NRC
R. I. McLean, DNR
J. H. Walter, PSC

R-2

ATTACHMENT (I)

COMMENTS ON NUREG-1437, SUPPLEMENT 1,
CALVERT CLIFFS NUCLEAR POWER PLANT DRAFT SUPPLEMENT TO THE
GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR
LICENSE RENEWAL OF NUCLEAR PLANTS

Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
May 19, 1999

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Appendix A

ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
1.	1-4	21	The federal register citation for the notice of acceptance for docketing is 63 FR 27891, not 26701.
2.	1-7	7	The surface water appropriation permit number and expiration date need to be corrected. The permit, CA715001 (02), expires on April 1, 2001.
3.	1-7	9, 10 and 15-17	Table 1-1 identifies consultation request dates for Fish and Wildlife Service (FWS), National Marine Fisheries Service, and Maryland Historic Trust, but does not identify the agencies' response dates. Should the responses from these agencies be provided in Table 1-1?
4.	2-1	28	The three crops do not all agree with the three given on page 2-22, line 11. Those on page 2-22 are correct (corn, wheat, and soy). Tobacco is not included in the list of crops grown on the Calvert Cliffs Nuclear Power Plant (CCNPP) site, and should be replaced with wheat on this list.
5.	2-1	34-37	The sentence beginning, "Part of the upper area..." is confusing, as it could be interpreted that St. Leonard Creek drains directly into the Chesapeake independently of the Patuxent River. [suggested rewording] "Part of the upper area, used primarily during the construction period, drain through the Johns Creek watershed into the St. Leonard Creek, which then drains into the Patuxent River approximately 7 km (4 mi.) from the plant. The Patuxent River drains into the Chesapeake Bay approximately 16 km (10 mi.) south of the plant."
6.	2-1	40	Using the term 'region' when referring to the Chesapeake is ambiguous and should be deleted from the sentence beginning on line 40. This sentence should be reworded, as follows: "The Bay has an average depth of approximately 9m (30 feet)..."
7.	2-1	43	The source of the referenced information is K. G. Selner & B. A. Peters [in Hock 1997]. Most style guides would not recommend referencing only the cover document. [Also, the original reference notes that the springtime condition described is found in the upper 20-30 km of the Bay...which is NOT in the vicinity of CCNPP.]
8.	2-4	7	The discharge structure is located offshore, beneath approximately 10 feet of water, and should not be discussed under the heading of External Appearance. Also, "service building intake structure" is not CCNPP terminology; this building is referred to as the Intake Structure. This sentence should be corrected, as follows: "The Intake Structure is located east (beyside)..."
9.	2-5	Fig 2-3	The legend of the map should include 69-kV Southern Maryland Electric Cooperative (SMECO) transmission line, as this figure is called out (on page 2-16, line 46) in reference to this plant feature.
10.	2-10	4	There is no (BOE 1998a) in the reference list in Section 2.3.

ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
11.	2-10	22, 23	The sentence beginning "Each of the two reactors..." does not belong here. It is misleading in that the remainder of the paragraph discusses the circulating water system rather than the primary system. For clarity, this sentence should be relocated to line 34, after the sentence beginning, "The primary coolant loop...", and reworded as follows, "The primary coolant system for each unit consists of a reactor, two steam generators, two reactor coolant loops, and four reactor coolant pumps."
12.	2-10	27-29	A consistent source should be used for the dimensions of the intake and discharge channels. Calvert Cliffs' Updated Plant Safety Analysis Report (UFSAR), Figure 1-3B, shows these dimensions to be approximately 4500 ft and 850 ft, respectively. The intake channel length is taken from the baffle wall to the furthest point in the dredged channel, and the discharge channel length is taken from the shoreline to the end of the discharge conduit. (See comment for page 4-12, lines 9 and 15 and Figure 2-7.)
13.	2-10	30	The draft Supplemental Environmental Impact Statement (SEIS) refers to an "intake canal" in several places. This is incorrect terminology. Calvert Cliffs Nuclear Power Plant draws cooling water directly from the Bay through a dredged channel, not a canal as is common for other plants.
14.	2-11	Fig. 2-7	The dimension of the intake channel should be shown to be "Approximately 4,500 ft." per UFSAR Figure 1-3B. (See comment for page 2-10, lines 27-29 and page 4-12, lines 9 and 15.)
15.	2-12	4	For clarity, this sentence should be revised to add the word "groundwater," as follows: "CCNPP has five groundwater production wells..."
16.	2-12	5	The draft SEIS indicates that nine wells supply water for domestic use in outlying areas. One of the nine wells was abandoned and was excluded from Environmental Report (ER) Table 2-3 and Figure 2-7. This change should also have been made in the second paragraph of ER Section 2.1.4, which may have been the basis for the statement in the draft SEIS.
17.	2-12	9-10	For clarity, this sentence should be revised, as follows: "Groundwater wells provide the source water for domestic, plant service and desalination make-up water needs..."
18.	2-12	11	For clarity, this sentence should be revised, as follows: "...discharged through the submerged outfall to the Chesapeake Bay."
19.	2-12	Section 2.1.4	A source reference should be provided for the description of CCNPP's radioactive waste processing systems.
20.	2-13	32	The draft SEIS indicates that the concentration limits of liquid effluents meet the specifications of 10 CFR Part 20, Appendix B, Table 2. This Table reference is to the current version of Part 20, whereas CCNPP's effluent control program, as discussed in the Offsite Dose Control Program (ODCP), is to the older version of Part 20. Therefore, the correct reference for CCNPP would be 10 CFR Part 20, Appendix B, Table II. (NOTE: Use of the maximum permissible concentration values in the old Table II still ensures that the current effluent concentration limits in Table 2 are met.)

ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
21.	2-13	9	It is unclear which system is considered the "Liquid Radwaste Treatment System", as this is not BGE terminology. The Reactor Coolant Waste Processing System (RCWPS) and Miscellaneous Waste Processing System are collectively considered liquid waste processing systems.
22.	2-13	18	The RCWPS has four Reactor Coolant Waste ion exchangers.
23.	2-13	23-24	Taken individually, the first three sentences of the fifth paragraph of Section 2.1.4.1 are technically accurate; however, the order of these sentences does not follow the process pathway of the RCWPS. Reactor Coolant Waste liquid is filtered and passed through the ion exchangers prior to being transferred to the Reactor Coolant Waste receiver tanks.
24.	2-13	46	[editorial comment] It appears that a word is missing from the sentence describing normal operation of the Waste Gas Processing System (WGPS). The sentence should be revised, as follows: "... designed to store the gases removed from liquid waste ..."
25.	2-14	15	[editorial comment] "turbine building ventilation." should be a separate bullet.
26.	2-14	17	To clarify the statement regarding the control of gaseous releases, the sentence on line 17 should be replaced with the following: "Potential release pathways are sampled according to approved plant procedures. Occasional releases from abnormal pathways are quantified and recorded. BGE maintains all gaseous releases within ODCM limits." This text is taken from the CCNPP UFSAR, Revision 25.
27.	2-14	19 and 35	The name "Gaseous Radwaste Treatment System (GRTS)" is not BGE terminology. The terminology used earlier in the draft SEIS should be used here as well (WGPS).
28.	2-14	27-29	The dose rates provided in lines 27 through 29 are annual limits, and should be provided in terms of mSv/year (mrem/year). They should be clearly identified as annual dose limits.
29.	2-14	28	The skin dose rate limits should be 30 mSv/year (3000 mrem/year).
30.	2-14	35	Although CCNPP design incorporates filters and waste gas processing equipment that collectively may be referred to as ventilation exhaust treatment equipment, the plant design does not include a "Ventilation Exhaust Treatment System," per se. Therefore, the draft SEIS should be revised, as follows: "The WGPS is used to reduce radioactive material in gaseous waste ..."
31.	2-15	3	For accuracy, the first sentence of Section 2.1.4.3, Solid Waste Processing, should indicate that BGE packages solid waste according to the applicable requirements of 49 CFR Parts 171 through 177. Disposal and transportation are performed in accordance with the applicable requirements of 10 CFR Parts 61 and 71, respectively.

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
32.	2-15	9-10	The draft SEIS states that RCWPS evaporator bottoms are normally recycled or may be solidified after use. Baltimore Gas and Electric Company's Process Control Program does not include provisions for waste solidification. This sentence should be revised as follows: "RCWPS evaporator bottoms are normally recycled otherwise processed in accordance with BGE's Process Control Program."
33.	2-15	13	The draft SEIS states that dry active waste is temporarily stored in the Materials Processing Facility until it can be shipped to a permanent disposal facility. This sentence should be revised to indicate that dry active waste may alternatively be shipped to a processing facility.
34.	2-15	24	Although much of Lake Davies is an undeveloped field, the interim resin storage facility is located on a crushed gravel pad. Therefore, this sentence would be more accurate if the word "meadow" were deleted.
35.	2-15	25,25	The draft SEIS discusses the two areas used for resin storage at CCNPP: the interim resin storage facility and the West Road Cage. The SEIS notes that the interim resin storage facility was designed for up to five years of storage, and the West Road Cage provides interim storage for up to five years. By SECY-94-198, the NRC noted that there was no health and safety basis for the five-year criterion, and eliminated this criterion from GL 81-38. Therefore, the statements indicating that these areas provide interim storage for up to five years should be removed from the draft SEIS.
36.	2-15	33	Offsite processing facilities are also used for decontamination of equipment. The bullet on line 33 should say, "offsite processing facility for segregation, recycling, compaction, decontamination, and incineration."
37.	2-16	7, 8	For completeness, this sentence should be reworded, "Long-term outages are scheduled for refueling and for maintenance, modification and/or replacement of major components."
38.	2-16	18	There is no (NRC 1996) in the reference list in Section 2.3.
39.	2-17	22	Reference (Calvert County 1997) should be (Calvert County 1997a). (See comment for page 2-48, lines 25, 27.)
40.	2-17	37	The methodology for citing the reference from the Chief - Coastal Zone Consistency, Maryland Department of the Environment (MDE) is not consistent with that for other references from MDE. For consistency, this reference should be called out on page 2-17, line 37 as (MDE 1998), not (Olgienelli 1998), and the reference source on page 2-49 should be revised accordingly.
41.	2-18	1	Reference (Calvert County 1994) needs to be either 'a' or 'b' per Sec. 2.3.
42.	2-18	21	The text indicates that the average daily groundwater withdrawal rates over the last two years was 1.89×10^3 m ³ /h (392,000 gpd). A reference should be provided for this value (possibly BGE's November 20, 1998 Request for Additional Information (RAI) response submitted as well as defining the

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
43.	2-19	15	The sentence beginning, "According to EPA..." needs a reference citation.
44.	2-20	21	The draft SEIS indicates that the site includes approximately 80 ha (200 acres) of marshlands. A reference should be indicated for the source of this information and the location of the marshlands.
45.	2-20	21-23	It is suggested that this paragraph be moved to follow the paragraph beginning, "Two Federally protected species..." so that the first three paragraphs will address saltwater resources, and the last two paragraphs will address fresh water species.
46.	2-20	23	[up.] Atlantic loggerhead turtle...
47.	2-20	27-28	The text indicates that BOE has "... occasionally collected the shortnose sturgeon." Based on analysis of the monthly trawl samples of fishes taken in the vicinity of CCNPP between 1969 and 1981, it is apparent that only one shortnose sturgeon fish was captured during that period, in May 1979 (Reference: Heck, K.L., Jr., [Ed.] 1987. <i>Ecological Studies in the Middle Reach of Chesapeake Bay. Lecture Notes on Coastal and Estuarine Studies</i> . Springer-Verlag-Berlin, Heidelberg, New York.)
48.	2-20	41-42	The term 'associations' would be more appropriate than 'biomes' in this context.
49.	2-20	43	There are various species of <i>Quercus</i> in this association. The specific species "rubra and alba" should be replaced with " spp" to indicate the multitude of species present.
50.	2-21	Tables 2-3 and 2-4	Provide reference source for material in Tables 2-3 and 2-4. If possible, provide additional information as to what parts of the Chesapeake Bay these species are located.
51.	2-22	4	Replace <i>Asplen</i> with <i>Rhododendron</i> .
52.	2-22	6	Since there were two plans created for two separate parcels of land, the sentence should begin, "In 1985 and 1987, BOE foresters..."
53.	2-22	7	The correct agency is the Maryland Department of Natural Resources.
54.	2-22	38	The second sentence on line 38 should be reworded, as follows: "These species are also protected under State..."
55.	2-23	Table 2-5	Provide reference source for material in Table 2-5. It is apparently derived from (BOE 1996). Also, on line 4, <i>Cleindella</i> is spelled incorrectly. The correct spelling is <i>Cleindella</i> , as per line 6.
56.	2-24	1	Every bold heading has a Section number (e.g., 2.2.7.1), unless it is also italicized.
57.	2-24	40	As per Table 2-6, 909 CCNPP employees live in Calvert County. Table 2-4 is in agreement with data provided by BOE in the November 20, 1998 submittal.
58.	2-24	42	Change reference to (US Department of Commerce [DOC] 1992a).
59.	2-25	12	[spelling correction] Harford.

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
60.	2-25	Table 2-6	The source document for Table 2-6 should be included in Section 2.3, References.
61.	2-25	28	The 1998 figures are not in Table 2-7 as the text states. If the 1998 figures are projections or estimates, the text should say so.
62.	2-26	Table 2-7	Provide reference source for material in Table 2-7.
63.	2-27	Table 2-8	Provide reference source for material in Table 2-8.
64.	2-30	26	The draft SEIS indicates that the highway is considered to meet Service Level C. Provide the source of this information, and clarify whether this rating applies to the portion of Route 2-4 near the plant.
65.	2-31	7	Figures 2-2 and 2-3 show the CCNPP location, but do not show "general land use and planned land use" as the text states.
66.	2-31	17 and 29	There is no reference (Calvert County 1997b), although there is a (Calvert County Planning Commission 1997b). (See comment for page 2-48, lines 25, 27.)
67.	2-31	42	This data should be supported by a reference citation.
68.	2-32	25 and 35	There is no reference (Calvert County 1997b), although there is a (Calvert County Planning Commission 1997b). (See comment for page 2-48, lines 25, 27.)
69.	2-33	8	Second sentence should begin, "The Forest Conservation Act,..."
70.	2-33	46	The text indicates that the ER estimated resident population. For accuracy, this sentence should be revised, as follows: "Sections 3.8.1 and 3.8.2 of the applicant's ER presented US census data for 1990 and estimated resident population for each decade..."
71.	2-34	6	Reference (Virginia Employment Commission 1993) is not listed in Section 2.3.
72.	2-39	45	Reference (Washington, DC Meyer's Office of Planning 1995) is not listed in Section 2.3.
73.	2-43	20	Reference (DOC 1996) is not listed in Section 2.3. Should it be DOC 1995?
74.	2-45	29-30	When a document is authored by more than two co-authors, they are typically not cited individually. Following this convention the report by Hopkins, Collier, and Fischer should be cited as (Hopkins et al 1992).
75.	2-47	References	Multiple citations from the same source should be listed in chronological order (e.g., Five BOE citations from 1970-1998 are randomly listed.)
76.	2-48	25, 27	The list of references identifies different sources for the Calvert County Zoning Ordinance and the 1997 Comprehensive Plan, but the dates include an alphabetic suffix, indicating that they were prepared by the same party. Both documents were adopted by the Calvert County Commissioners, so it may be more appropriate to identify them as "Calvert County 1997a" and "Calvert County 1997b."

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
77.	2-49	17	(See comment for p. 2-17, line 37.)
78.	2-49	24	K.L. Heck, Jr. is the editor of the referenced document. The citation should be indicated in the reference list [i.e., Heck, K.L., Jr., (Ed.)].
79.	3-2	23-27	Section 3.8 of the draft SEIS evaluates the potential environmental effects of refurbishment actions. In the afternoon session of the public meeting held on April 6, 1999, some confusion arose as a result of a statement made by BGE that there was no refurbishment to be conducted that affected anything outside the perimeter of the Protected Area. To clarify this statement, BGE hereby reaffirms the statement originally made on page 3-6 of the License Renewal Application - Environmental Report, and subsequently reiterated in the draft SEIS, that BGE "has not identified the need to undertake the major refurbishment activities that the GEIS (Generic Environmental Impact Statement) assumed for license renewal, and no other modifications have been identified that would directly affect the environment or plant effluents."
80.	4-7	18	Incorrect document reference. Should be (MDE 1994b).
81.	4-8	41	Incorrect document reference. Should be (MDE 1994b).
82.	4-8	45	Hirschfield & Hixson (1981) is the impingement portion of Academy of National Science-Philadelphia (ANSP) (1981). Therefore, the text essentially cites the same Clean Water Act (CWA) Section 316(b) study two different ways.
83.	4-9	7	Change Hirschfield & Hixson (1981) to ANSP (1981).
84.	4-9	7	The 316(b) demonstration was an analysis of three years of sampling. The sampling method used during the formal 316(b) demonstration was not unique to that study. It would be more appropriate to say that this method was employed for the formal 316(b) demonstration and was applied for a total of 21 years of continuous impingement monitoring.
85.	4-9	8-11	The sampling method description is misleading. For clarity, the following changes should be made: "The sampling schedule was based on repeating six-day cycles in order to sample each hour of the day with equal frequency over a 365-day period. On each sampling day, one-hour collections were made at each unit. Since data from an earlier impingement survival study at the CCNPP"
86.	4-9	12	The draft SEIS indicates that survival data from (Burton 1976) was used to assess potential survival of impinged species. However, the survival data applied were taken from three studies subsequent to Burton 1976. See ANSP 1981, p. V-4.
87.	4-9	17, 22, and 27	Replace 'impinged' with 'collected'.
88.	4-9	18, 23, and 28	[Add] "Yearly impingement estimates were . . ." The first line is a total number of finfish and blue crabs caught during each year throughout the collection periods. The second line is the annual impingement estimate based on the operating time of the plant.

R-10

R79,
A.1.4

ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
89.	4-9	29	The correct number is 261,763.
90.	4-9	32	For clarity and accuracy, this paragraph should be reworded, as follows: "Thus, for the 1977 through 1979 time frame, an annual average of 1,600,000 finfish and blue crabs were collected on the traveling screens, of which 260,000 did not survive. The expected monetary loss due to the death of finfish and blue crabs due to impingement was \$24,000 per year."
91.	4-9	36-39	It should be clarified that the ANSP (1981) study used the annual studies from 1977-79. The Horwitz (1987, in Heck, [Ed.]) summary report used the annual studies from 1975-83, including the same 1977-79 reports. The methods need not be described as though they were separate investigations, since they were all ANSP studies. Additionally, they were not 'concluded in 1983'. They continued for 12 more years. It would be better if the method were described once . . . then note that three of the annual summaries were used to satisfy the formal CWA Section 316(b) requirement and the first nine years of studies were compiled and summarized in Heck [really Horwitz] (1987). The protocol was complicated and did change in the early years but settled on a method that was designed to sample each generating unit separately during all times of the day and all tidal conditions.
92.	4-9	38	Randomly selected days were used only in 1975. The format became more structured after that, and continued for 21 years. While the ANSP and Heck studies are valuable as summary documents, it should be noted earlier in Section 4.1.2 that full, annual impingement investigations were conducted during the first 21 years of plant operation.
93.	4-9	43-45	The sentence that begins, "The number of potential episodes . . ." needs clarification. It is confusing and does not fit with the rest of the paragraph. If it can not be re-stated, it should be omitted. If this sentence is retained or reworded, the word "discrete" should be replaced with "discrete."
94.	4-10	24	[editorial correction] The sentence beginning on line 24 should read, "Experiments showed impingement survival of blue crabs . . ."
95.	4-10	30	To capture the breadth of the information in (BGE 1994b), it is suggested that the sentence beginning "Three summary studies . . ." be reworded, as follows: "In addition to 21 annual impingement surveys, three summary studies are discussed: . . ."
96.	4-10	32	The third summary reference should be corrected, as follows: " . . . (Heck 1987) and a 1989 Trends report developed by ANSP."
97.	4-11	16	This bullet indicates that certain environmental conditions (warm weather, thermally stratified Bay, and prolonged west or southwest winds) may not be attributable to CCNPP operations. It would be more accurate to say that these conditions are not attributable to plant operations.

R-11

ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
98.	4-11	31-33	The demonstration of thermal discharge effects is ascertained by CWA Section 316(a), not 316(b), as stated. Additionally, the 316(a) variance is based on thermal discharges, not cooling water intake structure design. The 316(b) discussion belongs in Section 4.1.2, Impingement.
99.	4-12	3	In other parts of the document, the law is called the CWA. For consistency, it is suggested that the same terminology be used here as well.
100.	4-12	9 and 15	A consistent source should be used for the dimensions of the intake and discharge channels. Calvert Cliffs' Updated Final Safety Analysis Report, Figure 1-3B, shows these dimensions to be approximately 4500 ft. and 850 ft., respectively. The intake channel length is taken from the baffle wall to the farthest point in the dredged channel, and the discharge channel length is taken from the shoreline to the end of the discharge conduit. (See comment for page 2-10, lines 27-29 and Figure 2-7.)
101.	4-12	9	CCNPP does not have an intake canal. (See comment for page 2-10, line 30.) In this case, the word "canal" should be replaced with either "channel" or "forebay."
102.	4-12	12	As discussed in the CCNPP Updated Final Safety Analysis Report, the condenser tubes for Unit 1 are austenitic stainless steel and those for Unit 2 are titanium. For clarity, the following wording is suggested, "The condenser shells contain austenitic stainless steel (Unit 1) and titanium (Unit 2) tubes."
103.	4-12	41	[typographical error] should say (0.4 m ³).
104.	4-18	33	For consistency with the GEIS definition, it is suggested that the discussion of sparseness be reworded, as follows, "Sparseness measures population density and city size within 32 km ..."
105.	4-19	20	"... BGE's estimate of 60 license renewal employees ..." should be revised to "... BGE's bounding estimate of 60 license renewal employees ...". Additionally, it should be clarified that BGE does not expect to hire any additional employees for license renewal, but used the NRC's bounding estimate of 60 as the basis for analyzing a bounding case scenario. This document should be very clear regarding the expectations for the license renewal period.
106.	4-20	15, 24	The text should be revised to indicate that the 60 additional license renewal employees is a bounding estimate.

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
107.	4-20	24	The draft SEIS indicates that 60 additional plant employees could generate a population increase of up to 577 people in Calvert and St. Mary's counties. Please explain how this number was calculated. Calculations performed by BOE indicate that the estimated population increase in these two counties would be 643 people, as follows: Percentage of employees in Calvert and St. Mary's counties per draft SEIS Table 2-6 ((909 + 256)/1309) 89% Maryland employment multiplier 3.9997 Average household size in Maryland 3.01 Based on this data, the estimated population increase in Calvert and St. Mary's counties was calculated, as follows: (60 employees x 89% x 3.9997 x 3.01 = 642.9 (643 people)).
108.	4-20	30, 31	Revise "... population increase of about 50 people ..." and "... (9 percent of 577) ..." to "... population increase of about 28 people ..." and "(9 percent of 643)", respectively, per the revised population projection discussed in the comment for page 4-20, line 24.
109.	4-20	36	Revise "... between 9500 to 15,000 additional liters per day (L/d) (2500 to 4000 gpd) ..." to "... between 11,600 to 17,400 additional liters per day (L/d) (2800 to 4400 gpd) ..." per the revised population projection discussed in the comment for page 4-20, line 24.
110.	4-20	39	Revise "An additional 50 residents, drawing an additional 15,000 L/d (4000 gpd) ..." to "An additional 58 residents, drawing an additional 17,400 L/d (4400 gpd) ..." per the revised population projection discussed in the comment for page 4-20, line 24. The recalculated water usage is still less than 1 percent of the current daily output of the Solemons and Lexington Park water supply systems, so the impact on the water supply would still be SMALL.
111.	4-21	16	The plant-related population increase for Calvert County should be revised from 433 to 502, based on the revised employment data in Table 2-6 ((909/1309) x 60 x 3.9997 x 3.01 = 501.6 (502 residents)).
112.	4-21	32	Revise to reflect annual payment, as follows: "... reaching approximately \$33 million per year by 2036."

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
113.	4-23	36-41	Section 4.4.5 of the draft SEIS, beginning on line 36, states the following: <p>"Because there is a distinct possibility that undiscovered and/or unrecorded prehistoric and historic period archaeological sites exist in the 2300-acre plant site, as well as currently undocumented historic structures, additional care must be taken during normal operation or maintenance to ensure that cultural resources are not inadvertently impacted. These activities may include not only operation of the plant itself but also land management-related actions such as farming, recreation, wildlife habitat enhancement, or maintaining/upgrading access roads throughout the plant site."</p> <p>These statements are unsubstantiated by BGE's ER, the State Historic Preservation Officer response, or any other data or analysis in the draft SEIS and should be removed.</p>
114.	4-24	9	The cited reference should be (NRC 1996c).
115.	4-24	35-36	The environmental justice discussion presented in this document should be more well-defined. Define "minority" and "significant contribution."
116.	4-24	35-36, and Figure 4-1	The figure appears to depict a 10-mile radius, rather than an 80 km (50-mile) radius as indicated. Also, a source reference for this map should be provided. The text on page 4-24, line 44-45 identifies specific communities; therefore, these communities should be identified on the figure.
117.	4-24	44	Same comment as page 4-24, lines 35-36; define "low income."
118.	4-24	45	(spelling error) <i>Huntingtown</i>
119.	4-25	Figure 4-1	The title for this figure is "Census Block Groups with Large Minority or Low-Income Populations." This appears to be inconsistent with page 4-24, line 36, which indicates that no Census block group showed a significant concentration of minority individuals. (This may be resolved by defining environmental justice terms, such as "minority", "low income", and "significant contribution.") In addition, to combine the two may be misleading. Two types of shading should be presented to represent each group (minority and low-income).
120.	4-26	7	[editorial correction] The word "issue" should not be plural. "For this issue ..."
121.	4-26	23	The conclusion for groundwater quality degradation (saltwater intrusion) says that there are no impacts of "radiation exposures to the public." The conclusion sentence needs to be corrected.
122.	4-26	26	Reference should be to Section 4.5.1.
123.	4-27	3	A reference needs to be cited for the groundwater withdrawal data. Also, this value (409,000 gpd) is not consistent with information provided in Section 2.2.2, Water Use. (See comment for page 2-18, line 21 and page 8-7, line 9)

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Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
124.	4-28	8	To more accurately reflect the FWS recommendations, the sentence describing constraints on site activities in the vicinity of bald eagle nests should be revised to indicate that this only refers to "active" nests. This sentence should be revised, as follows: "The FWS also recommended constraints on activities in the vicinity of active bald eagle nests..."
125.	4-28	12	The sentence beginning with "Any activities resulting..." should be reworded to more accurately reflect the FWS recommendation. [suggested wording] "It was further recommended that BGE initiate consultation with the FWS whenever activities are planned that would result in significant habitat changes within the 0.4 km (1/4 mile) radius of active bald eagle nests, regardless of time of the year."
126.	4-28	20	For clarity, the following wording is suggested: "Thus, operating license renewal should not..."
127.	4-28	20	[editorial correction] "of either" is repeated at the end of line 20.
128.	4-32	17	The reference citation should be corrected, as follows: "Heck, K. L., Jr. (Ed.) 1987..."
129.	4-32	22	[editorial correction] The correct date is April 8, 1981, not 1991.
130.	5-2	32	The draft SEIS indicates that BGE was still evaluating three "design" changes when the application was submitted. For accuracy, two of the three changes being reviewed were design changes, and one was a procedure change. It would be more accurate to indicate that "... BGE was still evaluating three proposed changes at the time..."
131.	5-2	39-40	Delete sentence, "As a result of further evaluation..." and change the first word of the following sentence from "This" to "The." The changes better reflect BGE's current position on SAMA 64b.
132.	5-2	42	The draft SEIS indicated that a watertight door is currently being installed under BGE's Corrective Actions Program. The severe accident management analysis (SAMA) to install a watertight door is being pursued under BGE's modification process, as per reference (BGE 1999).
133.	5-10	3	CCNPP does not have centrifugal charging pumps. For CCNPP, the benefit to be gained from providing a back-up source for component cooling water is to "... reduce the impact of a loss of component cooling by providing a means to maintain the reactor coolant pump seals after a loss of component cooling water."
134.	5-10	7	For clarity, revise the basis for SAMA No. 96 as follows, "This would allow extended use of high-pressure safety injection after the Saltwater System loss, which causes the ECCS pump room coolers to be lost."
135.	5-10	12	The modification proposed by SAMA No. 7 provides a benefit whenever room cooling is lost, not just in the event of a station blackout event. Therefore, the basis for this SAMA should be revised as follows, "This would improve the reliability of AFW when room cooling is lost."

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
136.	5-10	28-32	The SAMAs to improve DC power reliability provide a benefit not only during station blackout events, but whenever battery charging is lost. Therefore, the basis for SAMA Nos. 31 and 32 should be revised as follows: "This would extend the availability of DC power when battery charging is lost, thereby reducing the frequency of long-term station blackout core melt sequences and other losses of 125V DC power core melt sequences."
137.	5-10	36 and 40	Cross-tying 4 kV buses does not reduce the frequency of station blackout core melt sequences. This part of the basis for SAMA Nos. 33a and 33b should be deleted.
138.	5-10	44	The SAMA to use a portable generator to feed the 125V DC buses would provide a benefit during other losses of 125V DC, in addition to station blackout sequences. The basis for SAMA No. 34 should be revised, as follows: "... thereby reducing the frequency of long-term station blackout core melt sequences and other losses of 125V DC power core melt sequences."
139.	5-10	47	The SAMA to replace the batteries with a more reliable model theoretically would provide a benefit during other losses of 125V DC, in addition to station blackout sequences. The basis for SAMA No. 36 should be revised, as follows: "... thereby reducing the frequency of long-term station blackout core melt sequences and other losses of 125V DC power core melt sequences."
140.	5-11	21	The SAMA to provide an automatic bus transfer feature for the 120V vital AC system would reduce the frequency of spurious safety system actuation sequences, not station blackout core melt sequences. The basis sentence should be revised as such.
141.	5-11	46	The SAMA to increase the capacity of Condensate Storage Tank (CST) No. 12 would provide the benefit of reducing the frequency of long-term loss of feed core damage sequences, not station blackout or steam generator tube rupture sequences. Therefore, the basis for SAMA No. 69 should be revised, as follows: "... thereby reducing the frequency of long-term loss of feedwater core damage sequences, and other core damage sequences."
142.	5-12	7	The SAMA to automate desalinated water make-up to CST No. 12 would reduce the likelihood that CST No. 12 would be depleted during events that require CST No. 12. The primary benefits are reducing long-term loss of main feedwater, core damage scenarios (e.g., loss of offsite power), and loss of Service Water and Component Cooling Water make-up scenarios. Therefore, the basis for SAMA No. 74 should be revised, as follows: "... would permit continued inventory make-up to the CST during a loss of offsite power, thereby reducing the frequency of long-term loss of feedwater core melt sequences, as well as enhancing Service Water and Component Cooling Water System make-up capabilities."
143.	5-18	9	Change sentence beginning, "BGE determined that one..." to "BGE has determined that one of these SAMAs may be cost beneficial when..."

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
144.	5-19	35	The SAMAs that lead to greater benefits for Unit 2 are those involving improvements to the emergency diesel generators and their support systems, not the electrical systems.
145.	5-22	25	The bounding estimate for SAMA 48a indicates: "... a 17 percent 8.11 person-Sv (11 person-rem)/reactor-year reduction in offsite dose."
146.	5-23	29	The bounding estimate for SAMA 49 indicates: "... a 17 percent 8.11 person-Sv (11 person-rem)/reactor-year reduction in offsite dose."
147.	5-25	32	The subject of reference (BGE 1996c) should be <i>Severe Accident Mitigation Alternatives not Response to Question No. 23</i> .
148.	6-7	37	The proposed rule to amend 10 CFR 51.53 (c)(3)(ii)(M) addresses assessments of the environmental impacts associated with burnup to 42,000 MWd/MTU, but the draft SEIS indicates that average burnup rates up to 60,000 MWd/MTU are addressed in the evaluation supporting the proposed rule. The draft SEIS should be revised, as follows: "... with average burnup for the peak rod to current levels approved by NRC up to 42,000 MWd/MTU are found to not appreciably change the impact values contained in 10 CFR 51.52(c)..."
149.	7-3	10	[editorial correction] "The impacts would not be increased..."
150.	8-1	33	There is no (NRC 1996a) in Section 8.3. This should be (NRC 1996).
151.	8-3	10	It is suggested that the text, "and these are discussed in Section 8.2.4," be added to the end of the sentence identifying the types of alternative energy options that were evaluated.
152.	8-4 8-5 (line 25) through 8-6 (line 2)	5	The draft SEIS indicates that converting 360 ha (900 acres) of the CCNPP site to industrial use for the coal-fired generation alternative would be "... a detectable change that would noticeably alter the present land-use pattern," but would not destabilize any important airflows. This is consistent with the definition of a MODERATE impact presented on page xiv. However, the draft SEIS concludes that the land-use impacts of this alternative would best be characterized as SMALL.
153.	8-7	9	This sentence indicates that groundwater use is at a current average of 0.02 m ³ /s (450,000 gpd), but this is actually the permitted limit. The current average is actually 1.87x10 ⁻⁴ m ³ /s (392,000 gpd), as noted in Section 2.2.2, Water Use. (See comments for pages 2-18, line 3 and page 4-27, line 3.)
154.	8-9	13	[editorial correction] Add the word "of," as follows: "... large amounts of fly ash..."
155.	8-10	42-43	"... inventories would be required for lands not previously disturbed to the extent that no archaeological or historical resources might remain (e.g., Lake Davies)." This is an inappropriate example, as Lake Davies is part of the previously disturbed land.

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
156.	8-11	27-28	"consumption" implies that the cooling water is used and lost (e.g., evaporation). Blowdown is not consumption. Blowdown is a non-consumptive use in which the water/waters are returned to the Bay. Also, on line 28, it is unclear what is meant by the term "tempering water." Please ensure that the correct terminology is used.
157.	8-12	6	Comment column for Ecology Impact should read, "... impact to terrestrial ecology from salt drift."
158.	8-14	17	Remove "per hour" after 440 MW.
159.	8-15	Table 8-4	Land use under the greenfield site total acres should be revised from 110 to 500 acres according to text on page 8-16, lines 15-20.
160.	8-22	33	There is no Section 8.2.5 in this document; the discussion of imported electrical power, including a reference to Canadian hydropower is presented in Section 8.2.3.
161.	8-24	9	The incorrect reference (BGE 1998) is cited. The correct reference should be BGE's RAI response dated November 20, 1998.
162.	8-24	20	The unit name is "C.P. Grand CT."
163.	8-26	3	The incorrect reference (BGE 1998) is cited. The correct reference should be BGE's RAI response dated November 20, 1998.
164.	8-26 and 8-27	References	The BGE and MDE citations should be listed in chronological order.
165.	9-1	25	The text notes, "... (SEIS) presents the staff's preliminary analysis of the environmental impacts ..." The word "preliminary" sounds like there is more analysis to be performed and that the EA/SEIS is the first step. It is recommended that "preliminary" be deleted or replaced with "draft."
166.	9-4	23	The draft SEIS identifies an adverse impact, whereby: "Assuming the current pumping rate, the additional drawdown of water at an offsite well during the renewal term attributable to CCNPP operation is estimated to be less than 2 m (5 ft)." This is the first time in this document that this value is introduced; therefore, a discussion of its origin should be added to Section 4.5.1. Additionally, there is some uncertainty as to the location of the offsite well (possibly a hypothetical well located at the site boundary), and the pumping rate used to calculate this drawdown.
167.	9-4	26	This bullet indicates that a continued loss of fish and shellfish due to entrainment and impingement is inevitable, despite mitigative actions instituted in 1974. It is unclear what mitigative measures were implemented in 1974. Several mitigative actions that have been implemented since plant construction are discussed on page 4-11, lines 9 through 11. If page 9-4 is referring to the same measures, it should be revised to read, "Continued operation of CCNPP will result in continued loss of fish and shellfish due to entrainment and impingement despite mitigative measures instituted since plant construction." If this is referring to other measures, they should be described in Section 4.1.2.

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ATTACHMENT (I)

Comments on NUREG-1437, Supplement 1, Calvert Cliffs Nuclear Power Plant
Draft Supplement to the Generic Environmental Impact Statement for
License Renewal of Nuclear Plants

No.	Page	Line Nos.	Comment
168.	9-4	29	This sentence should be revised, as follows: "The bounding estimate of an additional 60 employees at CCNPP ..." (See comment for page 4-19, line 20.)
169.	9-4	43-46	The draft SEIS identifies permanent storage space for the spent fuel assemblies as a resource commitment associated with continued operation of the plant for an additional 20 years. Section 9.1.3 should be revised to clarify that the permanent storage space for spent fuel assemblies will be located at a permanent high-level repository, and not at the CCNPP plant site.
170.	Appendix E		Appendix E of BGE's EA includes the State Historic Preservation Officer response to the consultation letter. The response letter should be added to Appendix E of the draft SEIS.

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LETTER S

DSO?
T. Kenyon

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RULES & DIR. STANCH
US NRCJohn R. Griffin
SecretaryShirley K. Arthur
Deputy SecretaryPamela M. Glumkin
Governor
Kathleen Kennedy Townsend
Lt. Governor

Maryland Department of Natural Resources
POWER PLANT ASSESSMENT DIVISION
Thom State Office Building, 8-3
Annapolis, Maryland 21401-3397

May 26, 1999

Chief
Rules Review and Directives Branch
Division of Administrative Services
Mailstop T 6 D 59
U.S. NRC
Washington, DC 20555-0001

RE: Generic Environmental Impact Statement for License Renewal of Nuclear Plants:
Calvert Cliffs Nuclear Power Plant (NUREG-1437, Supplement 1)

Dear Sir:

Attached, please find additional comments which were provided by the MDNR's Forest, Wildlife and Heritage Service pertinent to our review of the subject document. We appreciate your consideration and incorporation in the final report.

The comments are as follows:

In addition to the species mentioned in the "Special Species Status" section of the SEIS, the Wildlife and Heritage Division's Natural Heritage database indicates that there are two more records for species of concern that should be incorporated into that text. These are Spurred Butterfly-pea (*Centrosema virginianum*), a state rare species, and Blunt-leaved Gerardia (*Agalinis obtusifolia*), a state endangered species. The *Centrosema* record is recent, and was described as being along a fire road on the property, south of St. John's Creek and east of Lavell Creek. The *Agalinis* record is from 1979, and was more general, but suggests that this species could occur on the property in the appropriate habitat.

In addition, the forested area on the project site contains potential Forest Interior Dwelling Bird Habitat. The conservation of this habitat is mandated within the Critical Area (COMAR 27.15.09.04) and strongly encouraged outside of the Critical Area. Consultation with Maryland Department of Natural Resources relative to this issue is required.

Sincerely,

Richard I. McLean
Manager, Nuclear Programs

RJM:rd

S-1

LETTER T



Nye County

DEPARTMENT OF NATURAL RESOURCES & FEDERAL FACILITIES

1210 E. Basin Rd. Ste. #6 • Pahrump, Nevada 89048
(702) 727-7727 • Fax (702) 727-7919

99-302-LB (L)

June 25, 1999

Mr. Thomas J. Kenyon
Office of Nuclear Reactor Regulation
Nuclear Regulatory Commission
Washington, DC 20555-0001

Comments on NUREG-1437, Supplement 1

Dear Mr. Kenyon:

Nye County has examined NUREG-1437, Volume 1, Addendum 1: Generic Impact Statement for License Renewal of Nuclear Plants, Main Report: Section 6.3 Transportation. When this document was first brought to our attention we had determined not to comment, since we view the Department of Energy's (DOE) Yucca Mountain Environmental Impact Statement (EIS), which the NRC is required to adopt, if practical, as the key opportunity to express our views on transportation issues. However, on further reflection, since Nye County is the ultimate destination for transportation of spent nuclear fuel to a proposed Yucca Mountain repository under any scenario and for all routes, and since transportation impacts are a serious concern for our local communities, we have decided to offer these summary comments. We realize that the formal comment period has passed, but trust you will consider and address these concerns as your process continues.

The Process for Preparing the Statement

According to the "Abstract", the purpose of the Supplement was to analyze the potential cumulative impacts of transporting spent nuclear fuel destined for the proposed Yucca Mountain high-level waste repository. This proposed repository is in Nye County, Nevada. Yet, Nye County was not informed or consulted in the preparation of the EIS or the Supplement. No public hearings were conducted in the destination state or county. Furthermore, a request by the State of Nevada to extend the 30-day comment period was rejected. The destination county should have been provided an opportunity to submit substantive input to an analysis of the potential impacts of transporting spent nuclear fuel destined for the proposed Yucca Mountain high-level waste repository.

Demonstrated Knowledge of Baseline Conditions

Most environmental impact statements describe existing or baseline conditions, then assess the impacts of the proposed action on those conditions. The supplement to NUREG-1437 does not mention that the proposed repository which is the destination for shipments of spent nuclear fuel is, in fact, in Nye County. Nor does it identify particular conditions in the destination county which exacerbate the potential impacts of spent nuclear shipments, e.g., its very limited capability for emergency response to incidents or accidents involving radiological materials, its two-lane highways with high large-truck volumes and accident rates, and narrow rights-of-way in rural communities. In effect, the Supplement seems to assume that, once past the convergence bottleneck of urban Las Vegas, shipments of spent nuclear fuel would have no further impact.

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October 1999

A-150

NUREG-1437, Supplement 1

99-302-LB (L)
Mr. Thomas J. Kenyon
Page 2 of 3
June 25, 1999

The destination county should have been mentioned and conditions in the destination county identified and addressed in an analysis of the effects of transportation of the nation's spent nuclear fuel to the proposed repository at Yucca Mountain.

Description of Cumulative Effects

Though intended to analyze potential cumulative impacts, the supplement to NUREG-1437 does not cumulatively address the impacts to human health of nuclear materials transport in the vicinity of the proposed Yucca Mountain high-level nuclear waste repository. Key omissions include: a) potential shipments of DOE spent nuclear fuel and high-level waste, and b) current and prospective future shipments of low-level radioactive waste from 15 or more sites in the defense complex to the Nevada Test site, also in Nye County. The cumulative analysis should not exclude risks associated with exposure to shipments of low-level radioactive waste and DOE spent nuclear fuel and high-level waste.

Analysis Limited to Human Health Impacts

We understand that the Supplement was designed to address human health impacts only, and those only on a probabilistic basis. However, the Supplement is intended to support a regulatory decision which would relieve utilities of the obligation to assess "downstream" transportation impacts in seeking license extensions. Such an analysis should address several impacts in addition to those on human health. We would suggest rigorous consideration of impacts for local emergency responders, and note that the destination county is grievously deficient in its emergency response capabilities. We would also suggest consideration of impacts on local property values, noting that 75,000 truck shipments of spent nuclear fuel could affect the value of adjacent residences, businesses and land. An analysis to relieve utilities of the obligation to assess transportation impacts on downstream communities should address all major impacts of transportation shipment on those communities.

The "Bounding" of Potential Health Effects

The Supplement to NUREG-1437 focuses on truck shipments of spent nuclear fuel as they would converge in the Las Vegas urban area, assuming that such an assessment would "bound" the potential radiological and accident risk effects of other mode/route options in other upstream and downstream communities. However, an option which avoids the Las Vegas Valley by routing truck shipments around the Nellis Air Force Range and down US-95 through the towns of Tonopah, Goldfield, Beatty, and Amargosa Valley (such as has been encouraged by the DOE Nevada Operations Office shipments of low-level radioactive waste to the Nevada Test Site) has been shown to significantly increase the risk of accident fatalities in the destination county and state, and to significantly increase the radiological risk to the maximally exposed individual—who in this case would live and work in rural communities, where residences and businesses are located much closer to the highway than the 100 feet assumed in this analysis. An analysis assessing transportation impacts on "downstream" communities should address mode/route options which would result in maximum accident risk and maximum radiological risk to the maximally exposed individual in the destination state and county.

The Feasibility of the Assumed Modal Option

The Analysis assumes the use of the large-capacity GA-49 truck cask, which has not been certified and must be used in combination with specially designed trucks, which have not been tested. It further assumes that such cask and truck systems will be available in the quantity required for the unprecedented spent nuclear fuel shipment campaign. Alternative cask systems for truck shipment could double or triple the number of shipments required. Nye County seeks assurance that the assumed truck cask system is feasible, and that DOE's proposed regional service contractor approach would feasibly result in the use of such a system for all shipments in the potential truck shipment campaign.

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99-302-LB (L)
Mr. Thomas J. Kenyon
Page 3 of 3
June 25, 1999

Shipment Sequencing

The Supplement appears to assume that oldest spent nuclear fuel would be shipped first to a repository. Our understanding is that the age of spent nuclear fuel simply provides a utility with a place in the shipment que, which can be used for any spent fuel owned by that utility, whether located at that site or others. Furthermore, under NUREG-1437, this fuel could include more highly enriched and higher burnup fuel, which could involve additional hazards in transport and storage. Does the analysis assume shipment of oldest fuel first? If so, how will institutional measures achieve such sequencing? If institutional measures will not achieve such sequencing, how will the maximum potential radioactive risk in shipment and storage or disposal be addressed?

Thank you very much for the opportunity to make comments and pose questions on an analysis of considerable potential importance for Nye County. We look forward to discussing these issues further with the NRC.

Very truly yours,
NYE COUNTY, NEVADA



Les W. Bradshaw
Manager
Nye County Department of Natural Resources and Federal Facilities

LB/cal

cc: Nye County Board of Commissioners
Nye County Manager
A. Benson
M. Giampaoli
M. Murphy
N. Stellavalo
J. Williams
R. Loux
AULG's

T-3

Appendix A

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 Pacific Northwest National Laboratory.

Name	Affiliation	Function or Expertise
NUCLEAR REGULATORY COMMISSION		
Ralph Architzel	Nuclear Reactor Regulation	Section Chief
Claudia M. Craig	Nuclear Reactor Regulation	Project Manager
Thomas Kenyon	Nuclear Reactor Regulation	Project Manager
Barry Zalcman	Nuclear Reactor Regulation	Section Chief
James H. Wilson	Nuclear Reactor Regulation	Ecology, Project Management
James Leuhman	Nuclear Reactor Regulation	Project Management
Robert Jolly	Nuclear Reactor Regulation	Environmental Specialist
Kimberly Leigh	Nuclear Reactor Regulation	Environmental Specialist
Thomas H. Essig	Nuclear Reactor Regulation	Health Physics
Robert Palla	Nuclear Reactor Regulation	Severe Accident Mitigation Alternatives
Sid Feld	Nuclear Regulatory Research	Severe Accident Mitigation Alternatives
Brooke Fenton	Nuclear Reactor Regulation	Administrative Support
Beverly Sweeney	Nuclear Reactor Regulation	Administrative Support
PACIFIC NORTHWEST NATIONAL LABORATORY^(a)		
Mary Ann Parkhurst		Task Leader
James V. Ramsdell, Jr.		Air Quality
Michael J. Scott		Socioeconomics
Jeffrey A. Ward		Aquatic Ecology
Eva Eckert Hickey		Radiation Protection
Rebekah Harty		Decommissioning
Paul R. Nickens		Cultural Resources
Paul L. Hendrickson		Land Use
Charles A. Brandt		Terrestrial Ecology
Susan L. Blanton		Aquatic Ecology
Lance W. Vail		Water Use, Hydrology
Sallie J. Ortiz		Technical Editor
Wayne Cosby		Technical Editor

(a) 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 for the Calvert Cliffs Nuclear Power Plant, Unit 1 and 2 License Renewal

April 8, 1998	Application for license renewal from the Baltimore Gas and Electric (BGE)
April 21, 1998	Letter to BGE stating notice of receipt of license renewal application on April 10, 1998
May 8, 1998	Letter to BGE stating the determination of acceptability for docketing the BGE application for license renewal submitted on April 10, 1998
May 19, 1998	Federal Register Notice (63 FR 27601) "Baltimore Gas & Electric Company; Calvert Cliffs Nuclear Power Plant Units 1 and 2; Notice of Acceptance for Docketing of the Application for Renewal of Facility Operating Licenses Nos. DPR-53 and DPR-69 for an Additional 20-Year Period."
May 22, 1998	Letter to BGE requesting further discussion on environmental justice and "new and significant" information in support of the environmental reviews for license renewal
June 4, 1998	Letter to BGE providing NRC's notice of intent to gather information in order to prepare a plant-specific supplement to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants, NUREG-1437 (GEIS) and to hold a public scoping meeting on July 9, 1998, as part of the scoping process
June 4, 1998	Memorandum to T. Essig noticing the public environmental scoping meeting on July 9, 1998
June 10, 1998	Federal Register Notice (63 FR 31813) "Baltimore Gas & Electric Company Calvert Cliffs Nuclear Power Plant, Units 1 and 2 Notice of Intent To Prepare an Environmental Impact Statement and Conduct Scoping Process."
June 17, 1998	Letter to BGE on the proposed NRC safety and environmental review schedule for the BGE application
June 17, 1998	Letter from BGE accepting invitation to participate in environmental scoping process

Appendix C

July 8, 1998	Federal Register Notice "Notice of Opportunity for a Hearing Regarding Renewal of Facility Operating License Nos. DPR-53 and DPR-69 For an Additional 20-Year Period"
July 28, 1998	Memorandum to T. Essig summarizing the environmental scoping meeting held in support for the review of the license renewal application
July 28, 1998	Memorandum to T. Essig detailing the Calvert Cliffs site visit in support of the environmental review for the license renewal application
September 9, 1998	Letter to BGE requesting additional information for the review of the Calvert Cliffs Nuclear Power Plant license renewal application regarding severe accident mitigation alternatives
September 28, 1998	Letter to BGE requesting additional information for the review of the Calvert Cliffs Nuclear Power Plant Environmental Report associated with license renewal
October 26, 1998	Letters to BGE and scoping process participants providing a copy of the Environmental Scoping Summary Report
November 20, 1998	Letter from BGE providing responses to the staff request for additional information regarding the environmental report
December 3, 1998	Letter from BGE providing responses to the staff request for additional information regarding SAMAs
December 3, 1998	Letter from BGE providing the impingement study
December 23, 1998	Memorandum to T. Essig noticing a meeting on the BGE responses to the request for additional information regarding SAMAs
January 28, 1999	Memorandum to T. Essig summarizing the January 7, 1999, meeting with BGE on SAMAs
February 24, 1999	Letter to BGE requesting comment on the CCNPP Draft Supplement to the Generic Environmental Impact Statement (SEIS).
February 24, 1999	Letter to EPA filing the CCNPP Draft SEIS with the EPA
February 25, 1999	E-mail from G. Abbe providing comments on the Draft EIS for CCNPP.

February 26, 1999	Memorandum to D. Matthews noticing the prepublication release of NUREG-1555 "The Standard Review Plans for Environmental Reviews for Nuclear Power Plants and Supplement 1 for Operating License Renewal."
March 2, 1999	Letter to BGE forwarding copy of the notice of availability regarding the CCNPP draft SEIS.
March 2, 1999	Letter from G. Mazetis providing comments on the Draft EIS for CCNPP.
March 3, 1999	Memorandum to F. Akstulewicz noticing the public meeting to accept public comments on the CCNPP draft SEIS.
March 5, 1999	Federal Register Notice (64 FR 10662) "Environmental Impact Statements; Notice of Availability."
March 8, 1999	Federal Register Notice (64 FR 11071) "Baltimore Gas and Electric Company. Calvert Cliffs Nuclear Power Plant Units 1 and 2; Notice of Availability of the Draft Supplement to the Generic Environmental Impact Statement and Public Meeting for the License Renewal of Calvert Cliffs Nuclear Power Plant, Units 1 and 2."
March 8, 1999	E-mail from S. Samuels providing comments on the Draft EIS for CCNPP.
March 18, 1999	Letter from T. Smith providing comments on the Draft EIS for CCNPP.
April 2, 1999	E-mail from S. Samuels providing additional comments on the Draft EIS for CCNPP.
April 9, 1999	E-mail from L. Romo providing comments on the Draft EIS for CCNPP.
April 10, 1999	E-mail from B. Larcom providing comments on the Draft EIS for CCNPP.
April 12, 1999	E-mail from J. Byrne providing comments on the Draft EIS for CCNPP.
April 12, 1999	Letter from D. Lochbaum providing comments on the Draft EIS for CCNPP.
April 27, 1999	Letter from J. Lemom providing comments on the Draft EIS for CCNPP.
May 4, 1999	Letter from R. Mills providing comments on the Draft EIS for CCNPP.
May 8, 1999	Letter from K. McAllister providing comments on the Draft EIS for CCNPP.
May 11, 1999	E-mail from J. Stahl providing comments on the Draft EIS for CCNPP.

Appendix C

May 12, 1999	Memorandum to C. Carpenter summarizing the meetings to discuss the Draft SEIS for CCNPP.
May 18, 1999	Letter from A. Brownstein providing comments on the Draft EIS for CCNPP.
May 19, 1999	Letter from R. McClean providing comments on the Draft EIS for CCNPP.
May 19, 1999	Letter from BGE providing comments on the Draft EIS for CCNPP.
May 20, 1999	Letter from R. McClean providing additional comments on the Draft EIS for CCNPP.
August 17, 1999	Letter from C. Yoder documenting consultations between BGE and the Maryland Department of Natural Resources.

Appendix D

Organizations Contacted

During the course of the staff's independent review of environmental impacts resulting from operations during the renewal term, the following Federal, State, regional, and local agencies were contacted. |

Academy of Natural Sciences of Philadelphia, Benedict Estuarine Research Center, St. Leonard, Maryland

Calvert Cliffs Nuclear Power Plant Visitors Center, Lusby, Maryland

Calvert County Catholic Charities, Huntington, Maryland

Calvert County Catholic Charities, La Plata, Maryland

Calvert County, Prince Frederick, Maryland

- Commissioners
- Department of Administration
- Department of Economic Development
- Department of Zoning and Planning, Historic Preservation, County Archaeologist

Calvert Marine Museum, Solomons Island, Maryland

Charles County, Planning and Growth Management, Charles County, Maryland

Jefferson Patterson Park and Museum, St. Leonard, Maryland

Long and Foster Realty, California, Maryland

Maryland Archaeological Conservation Laboratory, St. Leonard, Maryland

Maryland Commission on African American History and Culture, Calvert County Inventory

Maryland Department of Environment, Water Management Administration, Industrial Discharge Permit Division, Baltimore, Maryland

Maryland Department of Natural Resources, Power Plant Research Program, Annapolis, Maryland

Maryland Historic Trust/State Historic Preservation Office/Library, Crownsville, Maryland

Appendix D

St. Mary's County, Department of Economic and Community Development, St. Mary's County, Maryland

U.S. Environmental Protection Agency, Chesapeake Bay Program, Annapolis, Maryland

U.S. Geologic Survey, Annapolis, Maryland

University of Maryland, Center for Environmental Science, Chesapeake Biological Laboratory, Solomons Island, Maryland

Walden-Sierra, Leonardtown, Maryland

J.B. Waters & Associates, Inc., Prince Frederick, Maryland

Appendix E

BGE Compliance Status and Consultations

As part of BGE's application for renewal of their operating licenses for Units 1 and 2, the applicant prepared a list of licenses, permits, consultations, and other approvals obtained from Federal, State, regional, and local authorities pertinent to CCNPP station operations. This list was updated in its RAI response letter of November 20, 1998, and is attached.

Correspondence from Federal and State agencies acknowledging BGE's permits and status compliance with requirements is also attached including

- the cover page from the NPDES permit identifying effective dates
- BGE's signed surface water withdrawal form for its Water Appropriation and Use Permit
- MDNR letter stating that the permittee is in compliance with the NPDES permit
- NMFS letter concluding no endangered or threatened aquatic species were found in the project area
- FWS letter concurring with threatened or endangered terrestrial species identified at the site
- Coastal Zone Management Program certification.

ATTACHMENT (2)

ERRATA TO APPLICANT'S ENVIRONMENTAL REPORT -
OPERATING LICENSE RENEWAL STAGE

TABLE 1
FEDERAL, STATE, LOCAL, AND REGIONAL LICENSES, PERMITS, CONSULTATIONS, AND OTHER APPROVALS
PERTINENT TO CURRENT CCNPP STATION OPERATION^A

Agency	Authority	Requirements	CCNPP Number	Issue Date	Expiration Date	Remarks
EPA	Clean Water Act, Section 401	State Water Quality Certification	Not Applicable	June 16, 1994	June 15, 1999	Discharges permitted by MDE under NPDES are considered to have fulfilled this certification requirement (COMAR 26.08.02.10).
NRC	10 CFR Part 50	NRC license, CCNPP Unit 1	DPR-53	July 1974	July 31, 2014	None
NRC	10 CFR Part 50	NRC license, CCNPP Unit 2	DPR-69	August 1976	August 31, 2016	None
NRC	10 CFR Part 72	NRC license, CCNPP Independent Spent Fuel Storage Installation	SNM-2505	November 25, 1993	November 30, 2012	None
MDE	COMAR 26.11.02.03	Construction permits for specified air emissions from Nuclear Security Facility Emergency Diesel Generator	04-4-0041N	April 21, 1992	None unless project delayed per COMAR 26.11.02.06B	BGE would have to obtain additional construction permits before modifying the emergency diesel generators. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.
MDE	COMAR 26.11.02.03	Construction permits for specified air emissions from Emergency Diesel Generators (4)	04-90015, -0016, -0017, -0018N	September 24, 1993	None unless project delayed per COMAR 26.11.02.06B	BGE would have to obtain additional construction permits before modifying the emergency diesel generators. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.
MDE	COMAR 26.11.02.03	Construction permits for specified air emissions from Sandblast Booth	04-9-0019N	April 24, 1994	None unless project delayed per COMAR 26.11.02.06B	BGE would have to obtain additional construction permits before modifying the sandblasting booth. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.
MDE	COMAR 26.11.02.02	Air emission source registration for Auxiliary Steam Generators (2)	04-70-4-00014, -00015	April 21, 1970	None	BGE would have to re-register before making source modifications. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.

ATTACHMENT (2)
ERRATA TO APPLICANT'S ENVIRONMENTAL REPORT -
OPERATING LICENSE RENEWAL STAGE

TABLE 1
FEDERAL, STATE, LOCAL, AND REGIONAL LICENSES, PERMITS, CONSULTATIONS, AND OTHER APPROVALS
PERTINENT TO CURRENT CCNPP STATION OPERATION

Agency	Authority	Requirements	CCNPP Number	Issue Date	Expiration Date	Remarks
MDE	COMAR 26.11.02.02	Air emission source registration for Emergency Diesel Generators (3) (Auxiliary Building)	04-70-4-00016, -00017, -00018	April 21, 1970	None	BGE would have to re-register before making source modifications. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.
MDE	COMAR 26.11.02.02	Air emission source registration for Unit 1 Reactor	04-70-9-00001	November 20, 1970	None	BGE would have to re-register before making source modifications. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.
MDE	COMAR 26.11.02.02	Air emission source registration for Unit 2 Reactor	04-70-9-00002	November 20, 1970	None	BGE would have to re-register before making source modifications. BGE has submitted an application for an operating permit for CCNPP sources under the Clean Air Act Title V program administered by MDE under COMAR 26.11.02.
Calvert County Department of Public Works, Inspections, and Permits Division	Calvert County Erosion Sediment Ordinance	Permit for clearing and grading land	7244, Extended Detention Pond	June 30, 1993	None	Imposes restrictions on additional development within the Protected Area.
Calvert County Department of Public Works, Inspections, and Permits Division	Calvert County Erosion Sediment Ordinance	Permit for clearing and grading land	6936, Lake Davies Sediment Basin	October 23, 1992	None	Imposes restrictions on landfill activities within the Lake Davies Area.
MDEb	COMAR 26.17.06e	State Water Appropriation Permits for CCNPP groundwater	CA89C007 (01)	April 1, 1989	April 1, 2001	Rifle Range well; renewal applications due by February 14, 2001.

October 1999

ATTACHMENT (2)
ERRATA TO APPLICANT'S ENVIRONMENTAL REPORT -
OPERATING LICENSE RENEWAL STAGE

TABLE 1
FEDERAL, STATE, LOCAL, AND REGIONAL LICENSES, PERMITS, CONSULTATIONS, AND OTHER APPROVALS
PERTINENT TO CURRENT CCNPP STATION OPERATION^A

Agency	Authority	Requirements	CCNPP Number	Issue Date	Expiration Date	Remarks
MDE ^b	COMAR 26.17.06 ^c	State Water Appropriation Permits for CCNPP groundwater	CA83G008(02)	September 1, 1989	April 1, 2001	Visitors Center well; renewal applications due by February 14, 2001.
MDE ^b	COMAR 26.17.06 ^c	State Water Appropriation Permits for CCNPP groundwater	CA63G003(06)	September 1, 1989	April 1, 2001	Recreation Facility (Camp Conoy) wells (4); renewal applications due by February 14, 2001.
MDE ^b	COMAR 26.17.06 ^c	State Water Appropriation Permits for CCNPP groundwater	CA69G010(04)	September 1, 1989	April 1, 2001	Protected-area-vicinity wells (5); renewal applications due by February 14, 2001.
MDE	COMAR 26.04.06	Permit for managing sewage sludge	S-93-04-3091-E	January 21, 1993	January 20, 1998	Permit issued to BGE for transporting digested sewage sludge from CCNPP to the Solomons Island Wastewater Treatment Plant.
MDE	COMAR 26.04.06	Permit for managing sewage sludge	S-94-02-3422-E	February 10, 1994	February 9, 1999	Permit issued to Maryland Environmental Service for transporting wet-well sewage from CCNPP to Dorsey Run Wastewater Treatment Plant.
MDE	COMAR 26.04.06	Permit for managing sewage sludge	S-96-30-4172-E	April 25, 1996	April 24, 2001	Permit issued to BGE for transporting sewage sludge to the Virginia State line to be used at permitted sites in Tennessee.
MDE ^b	COMAR 26.17.06 ^c	State Water Appropriation Permit for CCNPP use of surface water for cooling	CA71S001(02)	September 1, 1989	April 1, 2001	Renewal application due by February 14, 2001.
MDE	COMAR 26.08.04	Wastewater Discharge Permit	State Discharge Permit Number 92-DP-0187 (NPDES No. MD 0002399)	June 16, 1994	June 15, 1999	This permit covers discharges from Outfalls 001, 002, 003, 004, 005, 006, 007. Calvert Cliffs Nuclear Power Plant Sewage Treatment Plant effluent is permitted for discharge via Outfall 001.
MDE	COMAR 26.10.01.08	Oil Operations Permit	92-OP-0257	NA	May 15, 1997	Tank numbers 396, 400, 412, 573, 575, 536, 578 (lube oil, diesel, waste oil, kerosene); BGE has submitted an application for permit renewal.

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NUREG-1437, Supplement 1

ATTACHMENT (2)
ERRATA TO APPLICANT'S ENVIRONMENTAL REPORT -
OPERATING LICENSE RENEWAL STAGE

TABLE 1
FEDERAL, STATE, LOCAL, AND REGIONAL LICENSES, PERMITS, CONSULTATIONS, AND OTHER APPROVALS
PERTINENT TO CURRENT CCNPP STATION OPERATION^a

Agency	Authority	Requirements	CCNPP Number	Issue Date	Expiration Date	Remarks
MDB	COMAR 26.10	Underground Storage Tank notification	Not applicable	September 24, 1997	None	Tank numbers 413, 641, 580, 579, 581 (waste oil, diesel, gasoline).
MDE	Memorandum of Understanding	Mixed waste management		March 1995	None	Acknowledges lack of commercial disposal capacity and establishes storage management requirements.

^a Acronyms and abbreviations:

EPA = Environmental Protection Agency
 COMAR = Code of Maryland Regulations

^b Permit issued by Maryland Department of Natural Resources. State transferred permitting authority to MDE June 1996.

^c Permit issued under COMAR 08.05.02, but State re-codified regulation as COMAR 6.17.06 coincident with transferring permitting authority to MDE.



MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

New
Permit
6/21/94

William Donald Schaefer
Governor

David A.C. Carroll
Secretary

STATE DISCHARGE PERMIT NUMBER	92-DP-0187
NPDES PERMIT NUMBER	MD0002399
EFFECTIVE DATE	June 16, 1994
EXPIRATION DATE	June 15, 1999

Pursuant to the provisions of Title 9 of the Environment Article, Annotated Code of Maryland, and regulations promulgated thereunder, and the provisions of the Clean Water Act, 33 U.S.C. § 1251 et seq and implementing regulations 40 CFR Parts 122, 123, 124, and 125, the Department of the Environment, hereinafter referred to as the "Department", hereby authorizes

Baltimore Gas and Electric Company
P. O. Box 1475
Baltimore, Maryland 21203

TO DISCHARGE FROM

The Calvert Cliffs Nuclear Power Plant

LOCATED

Two miles northeast of Lusby, Calvert County, Maryland

VIA OUTFALLS

001 through 007 as identified and described herein

TO

Chesapeake Bay and Goldstein Branch which are protected for water contact recreation, fishing, shellfish harvesting (Chesapeake Bay only), aquatic life, and wildlife in accordance with the following special and general conditions and map made a part hereof.

"Together We Can Clean Up"

⊗

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT

2500 Broening Highway • Baltimore Maryland 21224
(410) 631-3000 • 1-800-633-6101 • <http://www.mde.state.md.us>

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

October 13, 1998

Claudia Craig
License Renewal Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Re: Calvert Cliffs Nuclear Power Plant license renewal

Dear Ms. Craig:

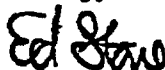
The Maryland Department of the Environment is the agency responsible for issuance of an NPDES discharge permit to the above mentioned facility (State Discharge Permit 92-DP-0187). This permit was issued on 06/16/1994 and is scheduled for renewal on 06/15/1999.

At this time the permittee is in compliance with all conditions of the permit.

While there are no major issues likely to block the re-issuance of this permit, it may be included in development and implementation of Total Maximum Daily Loads (TMDLs). The EPA is also promulgating new regulations for cooling water intake structures. Either of these pending developments may affect the renewal of this facility's discharge permit, requiring new limitations, but they should not prevent re-issuance.

If you have additional questions regarding this discharge permit, please give me a call at (410) 631-3323.

Sincerely,



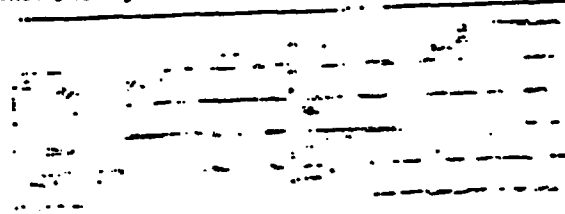
Edwal Stone, Chief
Industrial Discharge Permits Division
Water Management Administration

ES:srth

cc: Dave Lyons
Richard McClean - DNR (Power Plant Assessment Division)

TTY Users 1-800-735-3258
the Maryland Relay Service

**Together We Can Do*



MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER MANAGEMENT ADMINISTRATION
WATER RIGHTS DIVISION
2500 BROENING HIGHWAY
BALTIMORE, MARYLAND 21224

att 8 RAI
last page

June 15, 1998

Regarding Water Appropriation and Use Permit CA71S001(02)

Make Name/Address Changes Below

BALTIMORE GAS & ELECTRIC COMPANY
ATTN: C. E. EARLS
1650 CALVERT CLIFFS PARKWAY
LUSBY, MD 20657

Dear Permittee:

As a condition of your Maryland Water Appropriation and Use Permit you are required to report your water withdrawal every six months. Complete and return this form no later than July 31, 1998. If you have any questions concerning this form, please telephone the Water Rights Division at (410) 631-3591.

1998 SEMI-ANNUAL SURFACE WATER WITHDRAWAL REPORT

1. Check the method used to determine your withdrawal amounts:

☐ Flow Meter

☐ Elapsed Time Indicator

☒ Other (Explain) Hourly computer printout with daily average.
2. Enter the number of gallons of water withdrawn for each month.
 - If you have multiple intakes under this permit, please add together the monthly totals for all intakes.
 - Do not list continuous meter readings, hours pumped, or gallons in mgd.
 - Indicate a "0" for each month with no withdrawal.

January	1998	<u>106974000000</u>	April	1998	<u>59685000000</u>
February	1998	<u>95271000000</u>	May	1998	<u>53630000000</u>
March	1998	<u>105859000000</u>	June	1998	<u>95185000000</u>
		Total:	<u>516604000000</u>		

3. Please sign and date this form.

Submitted By: Chris Earls (C.E. Earls) Date: 7/24/98
Title: General Supervisor - Chem. Telephone Number: 410-495-6787

4. Make address corrections on the top of this form. .
Please contact this office if ownership has changed.



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Habitat Conservation Division
904 South Morris Street
Oxford, Maryland 21654

12 February 1998

Mr. Barth W. Doroshuk
Principal Engineer
Life Cycle Management Unit
Baltimore Gas and Electric
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

Dear Mr. Doroshuk:


We have reviewed your request to initiate informal consultation with respect to Section 7 of the Endangered Species Act for those species for which the National Marine Fisheries Service is responsible. After discussing the proposal with Ms. Julia Bradley of your staff, we have concluded that no endangered or threatened species within our purview are found in the project area, and further consultation pursuant to Section 7 is not required.

However, the endangered shortnose sturgeon (Acipenser brevirostrum) and the threatened loggerhead turtle (Caretta caretta) are found in waters adjacent to the project area. Therefore, should project conditions change or new information becomes available which changes the basis of this conclusion, consultation should be reinitiated.

It is stated in your letter that small numbers of shortnose sturgeon were collected in trawl surveys in the vicinity of your plant. Very little information exists for shortnose sturgeon in Chesapeake Bay. Consequently, we would greatly appreciate copies of any records that you have relative to this species.

If you have questions concerning our comments, please call me at (401) 226-5771.

Sincerely,


Timothy E. Goodger
Officer in Charge
Oxford Habitat Program





United States Department of the Interior

FISH AND WILDLIFE SERVICE

Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401

November 3, 1998

Mr. Barth W. Doroshuk
Life Cycle Management Unit
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, MD 20657

Re: Endangered and Threatened Species
Calvert Cliffs License Renewal

Dear Mr. Doroshuk:

We are writing in response to your letters of October 23 and November 20, 1997, regarding Endangered Species Act concerns relating to relicensing of the Calvert Cliffs Nuclear Power Plant (CCNPP) in Calvert County, Maryland. As you are probably aware, we have had numerous telephone conversations with Neil Haggerty of your staff since your letters were written; these conversations have facilitated the informal consultation process.

We concur with the list of threatened or endangered species provided in your October 23, 1997, letter. Three threatened species occur on the CCNPP site:

- o Puritan tiger beetle (*Cicindela puritana*)
- o Northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*)
- o Bald eagle (*Haliaeetus leucocephalus*).

The shortnose sturgeon (*Acipenser brevirostrum*) may also occur within the area affected by CCNPP operation, in the Chesapeake Bay. We understand that the National Marine Fisheries Service has already dealt with these potential impacts in their review of the project.

BGE is to be commended for entering into a conservation agreement with The Nature Conservancy (TNC) to protect tiger beetle habitat along its Chesapeake Bay shoreline. We support the continuation of this agreement. However, the agreement (or its manner of enforcement) does not allow TNC foot access to the beach below the cliffs; without such access

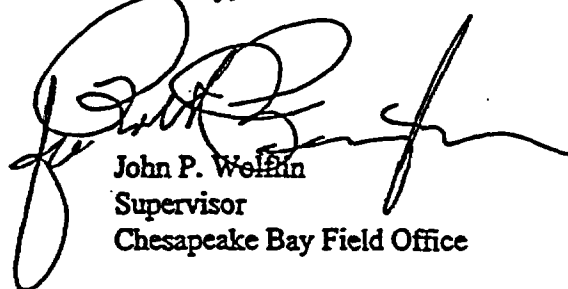
no meaningful monitoring of tiger beetle numbers can be conducted. This is the standard method of censusing threatened tiger beetles wherever they occur and has been done at cliff sites supporting Puritan tiger beetles at various locations along the Bay (Calvert, Kent, and Cecil Counties in Maryland) without mishap. Without such monitoring, there is no way of evaluating the effects of the management program for the CCNPP site. Therefore, we recommend that the conservation agreement between BGE and TNC be modified as soon as possible to allow foot access for tiger beetle survey purposes. With this modification, we believe the conservation agreement provides the necessary mechanism for avoiding adverse impacts to listed tiger beetles.

In addition, the Service recommends that in the future, following decommissioning, the Calvert Cliffs Nuclear Plant site be managed for the continued conservation of threatened species, primarily tiger beetles. This would provide an important contribution to the eventual recovery of the species. The Service supports putting a condition such as this in the FERC relicensing requirements for the plant.

To prevent adverse effects to nesting bald eagles, the Service recommends that the CCNPP allow no nonroutine human activities (e.g., construction, timber harvest, heavy machinery operation) within 1/4 mile of active bald eagle nests during the nesting season (December 15 through June 15) unless these activities have first been coordinated with and received the approval of the Maryland Department of Natural Resources (contact Glenn Therres at 410-260-8572) and the Service. For activities, such as major construction and clear-cutting of timber within 1/4 mile of the nest, which significantly change the habitat within this radius, consultation with the Service should be initiated by CCNPP regardless of the time of year the activity is to take place. Provided these two conditions are followed, we would expect no adverse effects on the bald eagle to result from plant operation or relicensing of the plant.

Thank you for the opportunity to provide comments. If you have any questions regarding this letter, please contact Andy Moser of my Endangered Species staff at (410) 573-4537.

Sincerely,



John P. Wolf
Supervisor
Chesapeake Bay Field Office

ATTACHMENT (2)**APPENDIX H - APPROVALS AND CERTIFICATIONS
APPLICANT'S ENVIRONMENTAL REPORT - OPERATING LICENSE RENEWAL STAGE****COASTAL ZONE MANAGEMENT PROGRAM CONSISTENCY CERTIFICATION**

Maryland's Coastal Zone Management Program (CZMP) was developed pursuant to the Federal Coastal Zone Management Act of 1972, as amended. The program was approved by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, in August 1979. Section 307 of the Act requires that federal activities, including federal licenses and permits, be consistent with a state's federally-approved CZMP. Applicants for federal licenses and permits are required to certify that the proposed activity is consistent with a state's CZMP. Accordingly, Baltimore Gas and Electric Company (BGE) hereby certifies that the proposed Calvert Cliffs Nuclear Power Plant (CCNPP) license renewal complies with and will be conducted in a manner consistent with the Maryland CZMP.¹

Proposed Activity

Baltimore Gas and Electric Company operates CCNPP Units 1 and 2 in accordance with NRC licenses DPR-53 and DPR-69, respectively. The Unit 1 license will expire on July 31, 2014, and the Unit 2 license on August 13, 2016. Baltimore Gas and Electric Company is applying to NRC for renewal of both licenses, which would enable 20 additional years of operation (i.e., until July 31, 2034 for Unit 1 and August 13, 2036 for Unit 2).

Calvert Cliffs Nuclear Power Plant is in Calvert County, Maryland, on the west bank of the Chesapeake Bay, approximately 40 miles southeast of Washington, DC, and 7.5 miles north of Solomons Island, Maryland (Figure 2-1). Figures 2-3, 2-4, and 2-5 illustrate the site layout, the station layout, and the protected area layout. As shown in Figure 3, the protected area of the plant is located within the 1,000-foot Chesapeake Bay Critical Area Limit.

The CCNPP fuel is uranium dioxide in the form of pellets with an enrichment up to 5-percent by weight uranium-235. The NRC has licensed CCNPP to operate on a 24-month refueling cycle, and a fuel burnup of 60,000 megawatt-days per metric ton of uranium. Baltimore Gas and Electric Company stores CCNPP spent fuel onsite in a spent fuel pool and in dry storage.

Baltimore Gas and Electric Company uses groundwater to supply process and domestic-use water at CCNPP. The State of Maryland has permitted BGE to withdraw no more than 450,000 gallons per day from the Aquia Aquifer. Calvert Cliffs withdraws an average of about 225,000 gallons per day (157 gallons per minute) and has never approached the permit limit. The quantities of groundwater withdrawn for CCNPP have followed a downward trend due primarily to improved technology for the control of water quality chemistry, which has enabled BGE to recirculate water longer before discharge, resulting in less demand for makeup water.

Baltimore Gas and Electric Company currently has a CCNPP workforce of approximately 1,770 (1997) during routine operations. The workforce commutes predominantly from Calvert and St. Mary's Counties. Approximately 60 percent of the employees (1,060) live in Calvert County, 16 percent live in St. Mary's County, and the remaining 24 percent live in other locations. The site workforce increases by as many as 700 temporary workers during refueling outages (one to three months) that occur about once a year.

In compliance with NRC regulations, BGE has analyzed the effects of plant aging and identified activities needed for CCNPP to operate an additional 20 years. Baltimore Gas and Electric Company

¹

This certification is patterned after draft model certification included as Attachment 8 of Reference (3).

ATTACHMENT (2)**APPENDIX H - APPROVALS AND CERTIFICATIONS
APPLICANT'S ENVIRONMENTAL REPORT - OPERATING LICENSE RENEWAL STAGE**

conservatively assumes that renewal of the CCNPP licenses would require the addition of no more than 60 workers to perform the additional license renewal surveillance, monitoring, inspection, testing, trending, and reporting during the period of extended operations. Calvert Cliffs' license renewal would involve no major plant refurbishment.

Calvert Cliffs supplies more than 12,000,000 megawatt-hours annually (exclusive of plant use), which is approximately 45 percent of the electricity that BGE supplies to its residential, commercial, and industrial customers (Reference 2). In other words, during the license renewal term, CCNPP would supply enough electricity for approximately one million homes for 20 years.

State Program

Maryland's CZMP is referred to as a "networked" program, which means that it is based on a variety of existing State authorities rather than a single law and set of regulations. The Maryland CZMP document (Reference 3) sets forth and discusses these authorities and how the State uses them to assure conformance with Coastal Zone Management Act (16 USC 1451 et seq.) requirements.² Tables 5-1 and 5-2 identify licenses, permits, consultations and other approvals necessary for CCNPP license renewal and continued operation.

Probable Effects

The NRC has prepared a generic environmental impact statement (GEIS) on impacts that nuclear power plant operation can have on the environment (Reference 4) and has codified its findings (10 CFR Part 51, Subpart A, Appendix B, Table B-1). The codification identifies 92 potential environmental issues, 68 of which are generically identified as having small impacts and are called "Category 1" issues. In its decision making regarding plant-specific license renewal environmental impacts, absent new and significant information, NRC will rely on its codified findings, as amplified by supporting information in the GEIS, for assessment of environmental impact [40 CFR 51.95(c)(4)]. The codification and GEIS discuss the following types of Category 1 environmental issues:

- Surface water quality, hydrology, and use;
- Aquatic ecology;
- Groundwater use and quality;
- Terrestrial resources;
- Air quality;
- Land use;
- Human health;
- Socioeconomics;
- Uranium fuel cycle and waste management; and
- Decommissioning.

For plants such as CCNPP that are located within the coastal zone, many of these issues involve impact to the coastal zone. Baltimore Gas and Electric Company has adopted by reference the GEIS analysis for all Category 1 issues.

²

The Maryland CZMP identifies the key enabling legislation as the Chesapeake Bay Critical Area Protection Act, the Tidal and Nontidal Wetlands Acts, and the Economic Growth, Resource Protection, and Planning Act.

ATTACHMENT (2)**APPENDIX H - APPROVALS AND CERTIFICATIONS
APPLICANT'S ENVIRONMENTAL REPORT - OPERATING LICENSE RENEWAL STAGE**

review and evaluate the potential impacts to Maryland's environment from the construction and operation of electric power generating and transmission systems. The Program summarizes these evaluations every other year in a document known as the Cumulative Environmental Impact Report. These reports discuss power plant air, water, terrestrial, radiological, and socioeconomic impacts, as well as various topical issues.

Findings

1. The Nuclear Regulatory Commission has determined that the significance of Category 1 issue impacts are small. A small significance level is defined by NRC as follows:

For the issue, environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource. For the purpose of assessing radiological impacts, the Commission has concluded that those impacts that do not exceed permissible levels in the Commission's regulations are considered small as the term is used in this table. (10 CFR Part 51, Subpart A, Appendix B, Table B-1)

Baltimore Gas and Electric Company has adopted by reference the NRC findings for Category 1 issues.

2. For applicable Category 2 issues, BGE has determined that the environmental impacts are small, as that term is defined by NRC. Impact to the coastal zone, therefore, would also be small.
3. To the best of its knowledge, BGE is in compliance with Maryland licenses, permits, approvals, and other requirements as they apply to CCNPP impacts on the Maryland coastal zone (see Table 1).
4. Calvert Cliffs' license renewal and continued operation of CCNPP facilities, and their effects, are all consistent with the enforceable policies of the Maryland Coastal Zone Management Program.

State Notification

By this certification that CCNPP license renewal is consistent with the Maryland CZMP, the State of Maryland is notified that, per 15 CFR 930.63(a), it has six months from the receipt of this letter and accompanying information in which to concur or object to the BGE certification. However, pursuant to 15 CFR 930.63(b), if Maryland has not issued a decision within three months following commencement of State agency review, it shall notify the contacts listed below of the status of the matter and the basis for further delay: The State's concurrence, objection, or notification of review status shall be sent to the following contacts:

Claudia Craig, Project Manager
Division of Reactor Program Management
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, Maryland 20855
(301) 415-1053

Barth W. Doroshuk, Principal Engineer
Life Cycle Management Unit
Baltimore Gas and Electric Company
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657-4702
(410) 495-4803

ATTACHMENT (2)**APPENDIX H - APPROVALS AND CERTIFICATIONS
APPLICANT'S ENVIRONMENTAL REPORT - OPERATING LICENSE RENEWAL STAGE**

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Baltimore Gas and Electric Company has adopted by reference the NRC findings for Category 1 issues.

2. For applicable Category 2 issues, BGE has determined that the environmental impacts are small, as that term is defined by NRC. Impact to the coastal zone, therefore, would also be small.
3. To the best of its knowledge, BGE is in compliance with Maryland licenses, permits, approvals, and other requirements as they apply to CCNPP impacts on the Maryland coastal zone (see Table 1).
4. Calvert Cliffs' license renewal and continued operation of CCNPP facilities, and their effects, are all consistent with the enforceable policies of the Maryland Coastal Zone Management Program.

State Notification

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ATTACHMENT (2)

**APPENDIX H - APPROVALS AND CERTIFICATIONS
APPLICANT'S ENVIRONMENTAL REPORT - OPERATING LICENSE RENEWAL STAGE**

References

1. NRR Office Letter No. 906, Revision 1; "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues," NRC Office of Nuclear Reactor Regulation, transmitted to all NRR employees, September 27, 1996
2. "FERC Form No. 1: Annual Report of Major Electric Utilities, Licensees and Others," Baltimore Gas and Electric Company, Baltimore, Maryland, December 31, 1993
3. "State of Maryland Coastal Zone Management Program and Final Environmental Impact Statement," U.S. Department of Commerce, August 1978
4. NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," May 1996
5. "Maryland Power Plants and the Environment: A Review of the Impacts of Power Plant and Transmission Lines on Maryland's Natural Resources, Supporting Materials," PPRP-CEIR-9/2, Maryland Power Plant Research Program, Maryland Department of Natural Resources, May 1996

NUCLEAR ENGINEERING

LCM-97-374
October 9, 1997F
FERL9703805
Baltimore Gas and Electric Company
Calvert Cliffs Nuclear Power Plant
1650 Calvert Cliffs Parkway
Lusby, Maryland 20657
410 586-2200

GDS/3

J. Rodney Little
Director and State Historic Preservation Officer
Maryland Historic Trust
100 Community Place
Crownsville, Maryland 21032

SUBJECT: Request for Historical and Cultural Consultations in Support of License Renewal Activity

- REFERENCES:
- (1) Letter to D. R. Muller (Atomic Energy Commission) from Orlando Ridout (The Maryland Historical Trust), Response to Inquiry Regarding Two Early Dwellings at the Calvert Cliffs Nuclear Plant Site in Maryland, dated June 15, 1972
 - (2) Goodwin, R. and Associates, Inc., *Phase II Archeological Evaluation of Sites 18CV61 and 18CV62, Calvert County, Maryland, Frederick, Maryland, 1993* *NR elig.*
 - (3) Goodwin, R. and Associates, Inc., *Archeological Examination of Structure Relocation and Road Realignment for Baltimore Gas and Electric Company, Calvert Cliffs to Chalk Point 500 kv Transmission Line Corridor - South Circuit, Calvert and Prince George's Counties, Maryland, Cambridge, Maryland, 1993*

Dear Mr. Little,

Baltimore Gas and Electric Company (BGE) is requesting initiation of historical and cultural resources consultations under Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470) and Federal Advisory Council on Historic Preservation regulations (49 CFR 800). Baltimore Gas and Electric Company is reviewing the option of license renewal for the Operating Licenses issued by the U.S. Nuclear Regulatory Commission (NRC) for Calvert Cliffs Nuclear Power Plant (CCNPP). Should BGE elect to pursue license renewal, historical and cultural resources consultation for this action would be needed.

The current Operating Licenses for CCNPP expire in the years 2014 (Unit 1) and 2016 (Unit 2), and BGE is preparing a license renewal application in accordance with NRC regulatory requirements. Nuclear Regulatory Commission guidance directs license applicants to consult with the appropriate State Liaison Officer for Historic Preservation. It is BGE's understanding that NRC uses this process in partial fulfillment of its obligations under Section 106 of the National Historic Preservation Act of 1966 and Federal Advisory Council on Historic Preservation regulations. Baltimore Gas and Electric Company is initiating this consultation in accordance with NRC requirements and will include a copy of this letter and your response in the environmental report to be submitted as part of the CCNPP license renewal application, should we decide to request renewal.

J. Rodney Little
Historical and Cultural Resources Consultation

LCM-97-374
Page 2 of 2

Baltimore Gas and Electric Company has operated CCNPP and its associated transmission lines since 1974. The plant is located near Lusby in Calvert County and the transmission lines are located in Calvert, Anne Arundel, and Prince Georges Counties (see attached figure for details). In 1971, the Maryland Historical Trust evaluated two historic dwellings located on the site, but found them to be too derelict to be nominated for inclusion on the *National Register*. However, following Maryland Historical Trust direction (Reference 1), BGE took photographs and salvaged some architectural elements of the structures. BGE continues to display these items in the Visitors Center (a remodeled old tobacco barn) on site.

During 1992 and 1993, archeological surveys were conducted along a proposed new transmission line right-of-way in Calvert County (see CCNPP to Chalk Point line on attached figure). As a result, two archeological sites were examined extensively during preconstruction surveys. One prehistoric site was found to retain sufficient subsurface integrity to be considered eligible for inclusion on the *National Register of Historic Places*; however, the historic and prehistoric artifacts found in 1992 did not provide unique information and the sites were dropped from further consideration. The impact areas of the right-of-way were evaluated extensively, and towers were located in areas that would not affect any intact subsurface artifacts (References 2 and 3).

Baltimore Gas and Electric Company is committed to maintaining the historic and cultural resources preserved at the Visitors Center, and this facility would continue to be used for public information and education. Baltimore Gas and Electric Company expects that operation of the plant through the license renewal period (an additional 20 years) would not adversely impact historic or cultural resources. Any maintenance activities that would be necessary to support license renewal would be contained within existing structures and facilities. Currently, no additional land disturbances or structural modifications have been identified for the purposes of supporting license renewal.

In reviewing the option of license renewal for CCNPP, BGE has consulted extensively with Dr. Richard McLean, Maryland Department of Natural Resources, Power Plant Assessment Program. We would appreciate your input at this time. If you have any questions, please call me at (410) 495-4803, Dr. McLean at (410) 260-8662, or our NRC License Renewal Environmental Project Manager, Claudia Craig, at (301) 415-1053.

Cone Pt.

Archeo - no
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(A) Ed

10/22/97

BWDSK
Barth W. Doroshuk
Principal Engineer
Life Cycle Management Unit

A review of BGE files and your submittal indicates that this project is unlikely to affect significant historic and archeological properties.

cc: C. H. Cruse (BGE)
T. N. Pritchett (BGE)
E. I. Bauereis (BGE)
T. G. Ringger (BGE)
J. P. Bennett (BGE)
R. I. McLean (MDNR)
C. M. Craig (NRC)
Section Office
LCM File (Environmental, LR)

Harry Shaffer
Office of Preservation Services
Maryland Historical Trust
10-22-97
Date

Appendix F

GEIS Environmental Issues Not Applicable to the Calvert Cliffs Nuclear Power Plant

The following table lists those environmental issues listed in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) (NRC 1996) and Table B-1 of Appendix B to 10 CFR 51 Subpart A that are not applicable to the Calvert Cliffs Nuclear Power Plant (CCNPP) because of plant or site characteristics.

ISSUE—10 CFR 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered thermal stratification of lakes	1	4.2.1.2.2 4.4.2.2	CCNPP cooling system does not discharge to a lake
Water-use conflicts (plants with cooling ponds or cooling towers using makeup water from a small river with low flow)	2	4.3.2.1 4.4.2.1	This issue is related to heat dissipation systems that are not installed at CCNPP
AQUATIC ECOLOGY (FOR PLANTS WITH COOLING-TOWER-BASED HEAT DISSIPATION SYSTEMS)			
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 CCNPP
Impingement of fish and shellfish	1	4.3.3	This issue is related to heat dissipation systems that are not installed at CCNPP
Heat shock	1	4.3.3	This issue is related to heat dissipation systems that are not installed at CCNPP
GROUND-WATER USE AND QUALITY			
Ground-water use conflicts (potable and service water, and dewatering; plants that use <100 gpm)	1	4.8.1.1 4.8.1.2	CCNPP uses > 100 gpm of ground water. Ground-water use conflict is discussed in SEIS Section 4.5.1.
Ground-water use conflicts (plants using cooling towers withdrawing makeup water from a small river)	2	4.3.2.1 4.4.2.1	This issue is related to heat dissipation systems that are not installed at CCNPP operated on bodies of water that are much smaller than Chesapeake Bay

ISSUE—10 CFR 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
Ground-water use conflicts (Ranney wells)	2	4.8.1.4	CCNPP does not have or use Ranney wells
Ground-water quality degradation (Ranney wells)	1	4.8.2.2	CCNPP does not have or use Ranney wells
Ground-water quality degradation (cooling ponds in salt marshes)	1	4.8.3	This issue is related to a heat dissipation system that is not installed at CCNPP
Ground-water quality degradation (cooling ponds at inland sites)	2	4.8.3	This issue is related to a heat dissipation system that is not installed at CCNPP and inland sites.
TERRESTRIAL RESOURCES			
Cooling tower impacts on crops and ornamental vegetation	1	4.3.4	This issue is related to a heat dissipation system that is not installed at CCNPP
Cooling tower impacts on native plants	1	4.3.5.1	This issue is related to a heat dissipation system that is not installed at CCNPP
Bird collisions with cooling towers	1	4.3.5.2	This issue is related to a heat dissipation system that is not installed at CCNPP
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to a heat dissipation systems that is not installed at CCNPP
HUMAN HEALTH			
Microbiological organisms (public health) (plants using lakes or canals or cooling towers or cooling ponds that discharge to a small river)	2	4.3.6	This issue is related to heat dissipation systems that are not installed at CCNPP and bodies of water much smaller than Chesapeake Bay.

F.1 References

10 CFR Part 51, "Environmental Protection Requirements for Domestic Licensing and Related Regulatory Functions."

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

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev.,
and Addendum Numbers, if any.)

NUREG-1437,
Supplement 1

2. TITLE AND SUBTITLE

Generic Environmental Impact Statement for License Renewal of Nuclear Plants
Supplement 1 Regarding the Calvert Cliffs Nuclear Power Plant
Final Report

3. DATE REPORT PUBLISHED

MONTH	YEAR
October	1999

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

6. TYPE OF REPORT

Environmental Impact Statement

7. PERIOD COVERED (Inclusive Dates)

8. PERFORMING ORGANIZATION - NAME AND ADDRESS (If NRC, provide Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)

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

9. SPONSORING ORGANIZATION - NAME AND ADDRESS (If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)

Same as above

10. SUPPLEMENTARY NOTES

Docket Nos. 50-317 and 50-318

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) by Baltimore Gas and Electric Company (BGE) to renew the operating licenses for the Calvert Cliffs Nuclear Power Plant (CCNPP) Units 1 and 2 for an additional 20 years under 10 CFR Part 54. The supplemental environmental impact statement includes the staff's analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and the alternatives available for reducing or avoiding adverse impacts. It also includes the staff's recommendations regarding the proposed action.

Based on the analysis and findings in the Generic Environmental Impact Statement, the Environmental Report submitted by BGE, consultation with other Federal and State agencies, its own independent review, and its consideration of public comments, the NRC staff recommends that the Commission determine that the adverse environmental impacts of license renewal for CCNPP Units 1 and 2 are not so great that preserving the option of license renewal for energy planning decisionmakers would be unreasonable.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

Calvert Cliffs Nuclear Power Plant
Supplement to the Generic Environmental Impact Statement
License Renewal
National Environmental Policy Act
NEPA

13. AVAILABILITY STATEMENT

unlimited

14. SECURITY CLASSIFICATION

(This Page)

unclassified

(This Report)

unclassified

15. NUMBER OF PAGES

16. PRICE



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