November 9, 2001

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 - DRAFT ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO A PROPOSED LICENSE AMENDMENT TO INCREASE THE LICENSED POWER LEVEL (TAC NOS. MB0842 AND MB0843)

Dear Mr. Kingsley:

Enclosed is a copy of the Environmental Assessment and Finding of No Significant Impact related to your application for amendments dated December 27, 2000, as supplemented on February 12, April 6 and 13, May 3, 18, and 29, June 5, 7, and 15, July 6 and 23, August 7, 8, 9, 13 (two letters), 14 (two letters), 29, and 31 (two letters), September 5 (two letters), 14, 19, 25, 26, and 27 (two letters), and November 2, 2001 (two letters). The original amendment request was submitted by Commonwealth Edison Company (ComEd), the former licensee. ComEd subsequently tranferred the licenses to Exelon Generation Company, LLC (Exelon, the licensee). By letter dated February 7, 2001, Exelon informed the Nuclear Regulatory Commission (NRC) that it assumed responsibility for all pending NRC actions that were requested by ComEd.

The proposed amendments would allow Exelon to increase its electrical generating capacity at Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), by raising the maximum thermal power level from 2511 MWt to 2957 MWt. This change is approximately 17.8 percent above the current licensed maximum power level for QCNPS.

The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

/RA/

Lawrence W. Rossbach, Project Manager, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 50-265

Enclosure: Environmental Assessment

cc w/encl: See next page

cc:

Exelon Generation Company, LLC
Site Vice President - Quad Cities
22710 206th Avenue N.
Cordova, Illinois 61242-9740

Exelon Generation Company, LLC
Station Manager - Quad Cities
22710 206th Avenue N.
Cordova, Illinois 61242-9740

Exelon Generation Company, LLC
Regulatory Assurance Manager - Quad Cities
22710 206th Avenue N.
Cordova, Illinois 61242-9740

U.S. Nuclear Regulatory Commission
Quad Cities Resident Inspectors Office
22712 206th Avenue N.
Cordova, Illinois 61242

William D. Leech
Manager - Nuclear
MidAmerican Energy Company
P.O. Box 657
Des Moines, Iowa 50303

Vice President - Law and
Regulatory Affairs
MidAmerican Energy Company
One River Center Place
106 E. Second Street
P.O. Box 4350
Davenport, Iowa 52808

Chairman
Rock Island County Board
of Supervisors
1504 3rd Avenue
Rock Island County Office Bldg.
Rock Island, Illinois 61201

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, Illinois 60532-4351

Illinois Department of Nuclear Safety
Office of Nuclear Facility Safety
1035 Outer Park Drive
Springfield, Illinois 62704

Document Control Desk-Licensing
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. John Skolds
Chief Operating Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. John Cotton
Senior Vice President, Operation Support
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. William Bohlke
Senior Vice President, Nuclear Services
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. Robert J. Hovey
Vice President
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. Jeffrey Benjamin
Vice President - Licensing and Regulatory
Affairs
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. K. A. Ainger
Director - Licensing
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. Robert Helfrich
Senior Counsel, Nuclear
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. Christopher Crane
Senior Vice President
Mid-West Regional Operating Group
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, Illinois 60555

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 - DRAFT ENVIRONMENTAL ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO A PROPOSED LICENSE AMENDMENT TO INCREASE THE LICENSED POWER LEVEL (TAC NOS. MB0842 AND MB0843)

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Sincerely,

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Project Directorate III
Division of Licensing Project Management
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Docket Nos. 50-254 and 50-265

Enclosure: Environmental Assessment
cc w/encl: See next page

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7950-01-P

UNITED STATES NUCLEAR REGULATORY COMMISSION

EXELON GENERATION COMPANY, LLC

DOCKET NOS. 50-254 AND 50-265

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DRAFT ENVIRONMENTAL ASSESSMENT

AND FINDING OF NO SIGNIFICANT IMPACT

RELATED TO A PROPOSED LICENSE AMENDMENT TO INCREASE THE

MAXIMUM THERMAL POWER LEVEL

AGENCY: U.S. Nuclear Regulatory Commission (NRC)

ACTION: Notice of opportunity for public comment

SUMMARY: The NRC has prepared a draft environmental assessment (EA) in connection with its evaluation of a request by Exelon Generation Company, LLC (Exelon, the licensee) for a license amendment to increase the maximum thermal power level at Quad Cities Nuclear Power Station, Units 1 and 2 (QCNPS), from 2511 MWt to 2957 MWt. This represents a power increase of approximately 18 percent for QCNPS. As stated in the NRC staff's February 8, 1996, position paper on the Boiling-Water Reactor Extended Power Uprate Program, the staff has the option of preparing an environmental impact statement if it believes a power uprate will have a significant impact. The staff did not identify a significant impact from the licensee's proposed extended power uprate at QCNPS; therefore, the NRC staff is documenting its environmental review in an EA. Also in accordance with the February 8, 1996, staff position paper, the draft EA and finding of no significant impact is being published in the Federal Register with a 30-day public comment period.

DATES: The comment period expires December 17, 2001. Comments received after this date will be considered if it is practical to do so, but the Commission is able to assure consideration only of comments received on or before December 17, 2001.

ADDRESSEES: Submit written comments to Chief, Rules Review and Directives Branch, U.S. Nuclear Regulatory Commission, Mail Stop T-6 D69, Washington, DC 20555-0001. Written comments may also be delivered to 11545 Rockville Pike, Rockville, Maryland 20852, from 7:45 a.m. to 4:15 p.m. on Federal workdays. Copies of written comments received will be available electronically at the NRC's Public Electronic Reading Room (PERR) link (http://www.nrc.gov/NRC/ADAMS/index.html) on the NRC Homepage or at the NRC Public Document Room located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland.

FOR FURTHER INFORMATION CONTACT: Lawrence Rossbach, Office of Nuclear Reactor Regulation, at Mail Stop O-7 D3, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, by telephone at (301) 415-2863, or by e-mail at lwr@nrc.gov.

SUPPLEMENTARY INFORMATION:

The NRC is considering issuance of an amendment to Facility Operating Licenses Nos. DPR-29 and DPR-30, issued to Exelon for the operation of QCNPS, Units 1 and 2, located on the Mississippi River in Rock Island County, Illinois. Therefore, as required by 10 CFR 51.21, the NRC is issuing this environmental assessment and finding of no significant impact.

ENVIRONMENTAL ASSESSMENT

Identification of the Proposed Action

The proposed action would allow Exelon, the operator of QCNPS, to increase its electrical generating capacity at QCNPS by raising the maximum reactor core power level from 2511 MWt to 2957 MWt. This change is approximately 18 percent above the current maximum licensed power level for QCNPS. The change is considered an extended power uprate (EPU) because it would raise the reactor core power level more than 7 percent above the original licensed maximum power level. QCNPS has not submitted a previous power uprate application. A power uprate increases the heat output of the reactor to support increased turbine inlet steam flow requirements and increases the heat dissipated by the condenser to support increased turbine exhaust steam flow requirements.

The proposed action is in accordance with the licensee's application for amendments dated December 27, 2000, and supplemental information dated February 12, April 6 and 13, May 3, 18, and 29, June 5, 7, and 15, July 6 and 23, August 7, 8, 9, 13 (two letters), 14 (two letters), 29, and 31 (two letters), September 5 (two letters), 14, 19, 25, 26, and 27 (two letters), and November 2, 2001 (two letters). The original amendment request was submitted by Commonwealth Edison Company (ComEd), the former licensee. ComEd subsequently transferred the licenses to Exelon. By letter dated February 7, 2001, Exelon informed the NRC that it assumed responsibility for all pending NRC actions that were requested by ComEd.

The Need for the Proposed Action

Exelon evaluated its resource needs for the period 2000-2014 and forecast a 28-percent increase in electrical demand by 2014 within its Illinois service area. The proposed EPU would provide approximately 0.76 percent additional generating capacity per unit at QCNPS. Exelon stated that in order to stay competitive, it must be able to fulfill not only customer power demands, but it also must sell power to other providers. In Illinois, approximately 40 gas turbine

plants of various sizes are proposed to be built. The proposed additional generating capacity at QCNPS would eliminate the need to build approximately two 100 MWe gas turbines.

Environmental Impacts of the Proposed Action

At the time of the issuance of the operating licenses for QCNPS, the NRC staff noted that any activity authorized by the licenses would be encompassed by the overall action evaluated in the Final Environmental Statement (FES) for the operation of QCNPS, which was issued in September 1972. The original operating licenses for QCNPS allowed a maximum reactor power level of 2511MWt. On December 27, 2000, Exelon submitted a supplement to its Environmental Report supporting the proposed EPU and provided a summary of its conclusions concerning the environmental impacts of the EPU at QCNPS. Based on the staff's independent analyses and the evaluation performed by the licensee, the staff concludes that the environmental impacts of the EPU are bounded by the environmental impacts previously evaluated in the FES, because the EPU would involve no extensive changes to plant systems that directly or indirectly interface with the environment. This environmental assessment first discusses the non-radiological and then the radiological environmental impacts of the proposed EPU at QCNPS.

NON-RADIOLOGICAL IMPACTS AT QCNPS

The following is the NRC staff's evaluation of the non-radiological environmental impacts on land use, water use, waste discharge, terrestrial and aquatic biota, transmission facilities, and social and economic conditions at QCNPS.

Land Use Impacts

The licensee has no plans to construct any new facilities or alter the land around existing facilities, including buildings, access roads, parking facilities, laydown areas, or onsite transmission and distribution equipment, including power line rights-of-way, in conjunction with the uprate or operation after the EPU. The EPU would not significantly affect the storage of

materials, including chemicals, fuels, and other materials stored above or under ground. Therefore, the FES conclusions on the impacts on land use would be valid under the EPU conditions.

Water Use Impacts

The steam produced by the QCNPS turbines is condensed in the condensers, demineralized, and pumped back to the reactor vessel. Approximately 2094 cubic feet per second (cfs) of cooling water used in the condensers is pumped from the Mississippi River and does not come in contact with the steam from the turbines. The original design called for a once-through cooling water system in which the heated water used in the condensers was combined with other water discharges and returned to the river downstream of the intake. Under this system, the FES stated that full power operation of both generating units at a total of 5022 MWt will cause a 23 °F temperature rise in 2270 cfs (2100 cfs through the condensers and 170 cfs through the service water) of Mississippi River water, the maximum flow through QCNPS. The cooling system has had several configurations due to concerns over thermal effects on the river biota. The original design called for open-cycle discharge of heated effluent along a straight wing dam into the deeper, higher velocity portion of the river. This system was replaced with a diffuser system consisting of 2 diffuser pipes laid across the bottom of the main river channel with regularly spaced jets that directed heated water into the river. A closed-cycle condenser cooling system was installed next, which included a spray canal with blow-down directed into a third diffuser pipe in the river. The spray canal was less efficient than anticipated and partial open-cycle operation of the condenser cooling system was implemented next. Finally, an extensive study concluded that QCNPS could operate at full load in the open-cycle mode while meeting National Pollutant Discharge Elimination System (NPDES) permit limits under most river flow conditions. QCNPS presently operates in this open-cycle mode.

Cooling water is withdrawn from the Mississippi River through a canal that is perpendicular to the river flow. The canal is 235 feet long, 180 feet wide, and 12 feet deep. Intake velocity at the mouth of the canal is about one foot per second. A floating boom extending to a depth of 33 inches covers the mouth of the canal to deflect floating material. Beyond the boom is a series of vertical metal bars spaced 2.5 inches apart (trash racks) that screen large pieces of debris from the intake. Travel screens with a 3/8 inch mesh further protect the circulating water pumps.

The staff evaluated surface water use and groundwater use as environmental impacts of water usage at QCNPS. Current flow conditions, based on equipment capacity constraints and operating history, is 2192 cfs. The licensee stated that the EPU would not change the hydrodynamics of the condenser cooling and that surface water withdrawal rates or the maximum flow of river water through QCNPS would not be affected by the proposed EPU. Therefore, the conclusions in the FES regarding surface water use are expected to remain valid.

Groundwater is drawn from five wells at QCNPS and is used for domestic purposes, for raising fish in the former spray canals, and for a variety of other industrial applications. Groundwater is not used for condenser cooling. The licensee stated that the proposed EPU would not involve an increase in the consumptive use of groundwater. The EPU would not impact the well water system flow path and does not require any additional cooling capacity from the groundwater in order to shed heat loads. Therefore, the staff's conclusions in the FES relative to groundwater use would remain valid for the proposed EPU.

Waste Discharge Impacts

The staff considered chemical discharges to surface water and sanitary sewer systems, cold shock to an aquatic biota, and air emission, as waste discharge impacts.

Surface Water and Sanitary Sewer System Discharges:

QCNPS operates under a NPDES permit issued by the State of Illinois which covers discharges to the open-cycle diffusers, wastewater treatment system, sanitary waste treatment plant, and radwaste treatment system blowdown. Special Condition 6 of the NPDES permit gives thermal limitations at the downstream boundary of the mixing zone, including a maximum temperature rise above natural temperature of 5 °F and maximum temperature limits for each month of the year. The permit also requires that the mixing zone not exceed 26 acres of the Mississippi River. To demonstrate compliance at low river flow conditions while operating under the open-cycle mode (the present mode of operation), a temperature monitoring curve was developed that allows calculations of permissible plant load as a function of river water. The temperature monitoring curve was modified in 1990, based on measurements taken during the drought years of 1988 and 1989. Based on this temperature monitoring curve, Special Condition 6 of the NPDES permit states that compliance is demonstrated when river flows are greater than 16,000 cfs and ambient river temperature is 5 °F or more below the maximum monthly limit. For river flows between 11,000 cfs and 16,000 cfs, compliance is demonstrated by either adjusting plant load based on the correlation in the temperature monitoring curve, or by actual monitoring of river temperatures at the downstream boundary of the mixing zone. At river flows less than 11, 000 cfs, the permit requires temperature monitoring at the downstream boundary of the mixing zone. The licensee proposes to modify the temperature monitoring curve to account for the increase in temperature of the discharged river water resulting from the EPU condition. Under EPU conditions, the maximum condenser-water temperature rise will be 28 °F; 5 °F higher than the current total maximum (condenser and service water) temperature rise of 23 °F. The revised temperature monitoring curve would raise the minimum river flows required for demonstrating compliance using river temperature monitoring at the downstream boundary of the mixing zone or adjusting plant load in accordance with the temperature

monitoring curve correlation. The flow at which the actual river temperature monitoring must be performed or plant load adjustment must be made increases from 16,000 cfs to 21,100 cfs under the proposed revised temperature monitoring curve. The licensee discussed the proposed monitoring curve change on July 28, 2000, with the Illinois Environmental Protection Agency (IEPA). A second meeting was held on December 15, 2000. The licensee made a formal request to revise the NPDES permit by letter dated March 14, 2001. Subsequent discussions between the licensee and the staff occurred on March 29, 2001, and October 17, 2001. The licensee stated that the IEPA would consult with and obtain the Iowa Department of Natural Resources (IDNR) concurrence before issuing a permit revision, in accordance with 40 CFR 123.10, "Public notice of permit actions and public comment period." The licensee stated that the IEPA issued the draft NPDES permit revision on October 15, 2001, for a 30-day public comment period. Full implementation of the EPU will not be accomplished until the IEPA and IDNR have given their concurrence to change the monitoring curve. Contingent on the concurrence of the IEPA and IDNR, it is the staff's conclusion that the FES would remain bounding under the EPU conditions.

QCNPS monitors wastewater streams as required by the NPDES permit, and only uses approved chemicals for conditioning water to prevent scaling, corrosion, and biofouling. Because an increase in the design capacity to withdraw water from the Mississippi River is not proposed for the EPU, the licensee stated that the current practices would not be altered.

Cold Shock:

Cold shock to aquatic biota results when the warm water discharge from a plant abruptly stops due to an unplanned shutdown, resulting in a river water temperature drop and the death of aquatic biota. The increased temperature of the QCNPS discharge is not expected to create cold shock to aquatic biota because of the extended period of time required to remove heat from the reactor and the rapid heat dissipation in the mixing zone from the diffuser's outfall.

The probability of an unplanned shutdown is independent of power uprate. Therefore, the risk of fish being killed by cold shock would continue to be bounded by the FES.

Air Emissions:

Other waste sources at QCNPS emissions from the plant heating boiler and diesel generators. Effluents from these pathways are controlled as required by the Clean Air Act. The EPU does not have a significant impact on the quality or quantity of effluents from these sources, and operation under power uprate conditions would not reduce the margin to the limits established by the regulations. Therefore, the conclusions in the FES would remain valid.

Terrestrial Biota Impacts:

A relatively small number of threatened and endangered terrestrial species have been recorded in Rock Island County, Illinois, and across the river in Muscatine and Scott counties, Iowa. The western prairie fringed orchid (*Platanthera praceclara*), eastern prairie fringed orchid (*Platanthaera leucophaea*), Indiana bat (*Myotis sodalis*), and bald eagle (*Haliaeetus leucocephalus*) are Federally-listed threatened or endangered terrestrial species and were identified in 1999 in either Rock Island, Muscatine, or Scott counties. The proposed EPU would not disturb the habitat of these species and would not affect their distribution. The FES stated that the operation of QCNPS is not expected to have any further adverse effect on the terrestrial flora or fauna, except to the extent that traffic on access roads and human activities related to station operation may force some wildlife away from the heavily used areas. Implementation of the EPU would not alter these conditions.

Therefore, the conclusions reached by the staff in the FES relative to impact on terrestrial ecology, including endangered and threatened plant and animal species, remain valid for the proposed EPU.

Aquatic Biota Impacts:

The staff evaluated the impingement, entrapment, and the rise in water discharge temperature on aquatic biota. The Mississippi River is a large and productive ecosystem. Effects on river biota, such as the phytoplankton, zooplankton, periphyton, benthic invertebrate, gizzard shad, freshwater drum, emerald shiner, river shiner, carp, bluegill, fish eggs, and larvae, from QCNPS have been investigated by the licensee. Local effects on lower trophic levels were apparent from these studies, but overall population levels in the vicinity of the QCNPS were not adversely affected. Effects on the abundance of fish eggs and larvae by QCNPS operation have been minimal. No verifiable effects on the fish biota from QCNPS operation have been found. Exelon, along with Southern Illinois University, carries out a stocking program. Fish, such as walleye and hybrid striped bass, are raised in QCNPS's inactive cooling canal and then released to the Mississippi River. Increases in the populations of these species have been found in the vicinity of QCNPS due to the river stocking program. Additionally, freshwater drum, channel catfish, flathead catfish, and white bass have also increased in abundance, while white and black crappie (backwater fish) have decreased in abundance as sedimentation associated with maintenance of the navigation channel has degraded backwater area and sloughs.

The EPU would cause temperature in the condenser cooling system to be higher than those associated with previous studies of thermal effects. The EPU would raise river water temperature in the condenser cooling system to a maximum of 28 °F above ambient, rather than the current maximum of 23 °F. The higher temperature is expected to cause a higher mortality rate for organisms entrained in the system. The entrainment of fish eggs and larvae may affect more species, with the possible exception of fish that spawn early in the year. The fish egg and larva entrainment rate, which historically is 0.5 to 1 percent of the total drifting by

QCNPS, would not change because water withdrawals would remain the same. The overall effect of an increase in entrained plankton mortality would not be significant for the local populations involved.

Higher effluent temperatures at the EPU conditions may also have an increased effect on non-motile biota in the discharge mixing zone. Drifting fish eggs and larvae mortality may increase in the mixing zone because fish eggs and larvae are more likely to succumb to upper lethal temperatures as opposed to a particular temperature increase. This is only expected to affect species that spawn late, after the peak period of larval drift, when ambient river temperatures are high and river flow may be lower. Fish eggs and larvae losses at low river flows are expected to be fairly small in total, and based on an approximate low river flow return frequency of once in 10 years, it is expected that these losses would not negatively affect recruitment to the fish community of Pool 14, which is the body of water directly behind Lock 14 on the Mississippi River.

A preliminary study of Federally-listed aquatic threatened and endangered species in the vicinity of QCNPS (within 32 kilometers) performed in 1996 by the Pacific Northwest National Laboratory listed the fanshell (*cyprogenia stegaria*), Higgin's eye pearly mussel (*lampsilis higginsi*), and fat pocketbook (*potamilus capax*). The Federally-endangered clams are not expected to be exposed to the high temperatures associated with the uprate because its preferred habitat does not include the main channel of the Mississippi River at this location. Some alteration in the timing of life cycles stages of other mussel species could occur. Adult and juvenile fish would be expected to avoid the increase temperature in the mixing zone and not be harmed. The FES notes the existence of the paddlefish (*polyodon spathula*); however, the paddlefish has not been collected near QCNPS recently.

Eight fish species listed by the State of Illinois and Iowa have been collected in the general vicinity of the diffusers. Of these, the grass pickerel (*Esox americanus*) and the western sand darter *(Ammocrypta clara)* are the most frequently collected. Grass pickerel is the only Illinois State-listed species in Pool 14 that may have a sustainable population. Individuals collected from other species appear only as transient in Pool 14. The grass pickerel is mainly taken in littoral and backwater areas and it is not expected to be in the main channel where elevated temperatures would occur. The western sand darter is occasionally collected in the main channel (10 specimens over a 25 year period) and could be exposed to high temperatures in the mixing zone area. Other than the pearly mussel and the fish mentioned above, no rare species are expected to occur in the vicinity of QCNPS.

Fish may become impinged on the intake structures protecting the condenser cooling water pumps because of water velocities leading into the structures and the diminished physical condition of the fish. Impingement has not had a deleterious effect on fish populations in the vicinity of QCNPS because sampling indicated that impingement affects mostly dead and moribund fish. There is no change in cooling water flow proposed for the EPU. Therefore, no differences in impingement rates are expected.

Based on the above, the staff expects that the conclusions in the FES about aquatic biota, including impingement and entrainment, and threatened and endangered species, would remain bounding under the proposed EPU conditions.

Transmission Facility Impacts

Environmental impacts, such as the installation of transmission line equipment, or exposure to electromagnetic fields and shock, could result from a major modification to transmission line facilities. The licensee stated that there would be no change in operating transmission voltages, onsite transmission equipment, or power line rights-of-way to support the

proposed EPU conditions. No new equipment or modification would be necessary for the offsite power system to maintain grid stability. However, an increase in onsite power would be required to support new equipment associated with the EPU. Power to service these additional energy needs would come from QCNPS' existing power supplies. Therefore, no significant environmental impacts from changes in the transmission design and equipment are expected, and the conclusions in the FES would remain valid.

The electromagnetic field (EMF) created by the transmission of electricity would increase linearly as a function of power; however, exposure to EMFs from the offsite transmission system would not be expected to increase significantly and any such increase would not be expected to change the staff's conclusions in the FES that there are no significant biological effects attributable to EMFs from high-voltage transmission lines.

No changes in transmission facilities would be needed for the EPU. QCNPS transmission lines are designed and constructed in accordance with the applicable shock prevention provisions of the National Electric Safety Code. Therefore, the expected slight increase in current, attributable to the proposed EPU, is not expected to change the staff's conclusion in the FES that adequate protection is provided against hazards from electrical shock.

Social and Economic Impacts

The staff has reviewed information provided by the licensee regarding socioeconomic impacts, including possible impacts to the QCNPS workforce and local economy. QCNPS employs more than 800 people and is a major contributor to the local tax base. QCNPS personnel also contribute to the tax base by payment of sales and property tax. The proposed EPU would not significantly affect the size of the QCNPS workforce and would have no material effect upon the labor force required for future outages. Because the plant modifications needed

to implement the EPU would be minor, any increase in sales tax and additional revenues to local and national business would be negligible relative to the large tax revenues generated by QCNPS. It is expected that improving the economic performance of QCNPS through lower total bus bar costs per kilowatt-hour would enhance the value of QCNPS as a generating asset and reduce the likelihood of early plant retirement. Early plant retirement could have a possible negative impact upon the local economy and the surrounding communities by reducing public services, employment, income, business revenues, and property values; these reductions could be mitigated by decommissioning activities in the short term. The staff expects that the conclusions in the FES regarding social and economic impacts are expected to remain valid under the EPU conditions.

The staff also considered the potential for direct physical impacts of the proposed EPU, such as vibration and dust from construction activities. The proposed EPU would be accomplished primarily by changes in station operation and a few modifications to the station facility. These limited modifications can be accomplished without physical changes to transmission corridors, access roads, other offsite facilities, or additional projects related to the transportation of goods or materials. Therefore, no significant additional construction disturbances causing noise, odors, vehicle exhaust, dust, vibration, or shock from blasting are expected, and the conclusions in the FES would remain valid.

Summary

In summary, the proposed EPU at QCNPS would not result in a significant change in non-radiological impacts, on land use, water use, waste discharges, terrestrial and aquatic biota, transmission facilities, or socioeconomic factors, and would not have other non-radiological environmental impacts from those evaluated in the FES. Table 1 summarizes the non-radiological environmental impacts of the EPU at QCNPS.

Table 1. Summary of Non-radiological Environmental Impacts of the EPU at QCNPS

Impacts	Impacts of the EPU at QCNPS
Land Use Impacts	No significant changes to land use or construction of any new facilities that would impact land use are needed.
Water Use Impacts	No changes are required to the rate of intake of surface water or groundwater to accomplish the EPU.
Waste Discharge Impacts	Temperature monitoring curve would be adjusted to reflect higher river flow conditions where physical measurement or load management occurs. Change to the hydrodynamics of the cooling system would not be significant. Equipment modifications or changes in operation in air emissions are insignificant and would not reduce the margin to the limits established in the regulations. The risk of cold shock to aquatic biota would not increase.
Terrestrial Biota Impacts	Federally-listed threatened or endangered species are known to exist within the land area, but no land area disturbance is needed.
Aquatic Biota Impacts	No changes to intake or outfall structures or flows; no significant impingement or entrainment impacts on aquatic biota would be expected. Rise in river water temperature could affect fish larvae and eggs, but impacts would be insignificant. No Federally-listed threatened or endangered species would be significantly affected.
Transmission Facilities Impacts	No change in operating transmission voltages, onsite transmission equipment or power line rights-of-way. Slight increase in onsite power would be required to support the additional EPU equipment which would come from existing power supplies. EMF would increase linearly with the EPU; however, no significant change in exposure rate would be expected.
Social and Economic Impacts	No significant change in size of QCNPS workforce. No significant disturbances from noise, odor, vehicle exhaust, dust, vibration, or shock would be anticipated.

RADIOLOGICAL IMPACTS AT QCNPS

The staff evaluated radiological environmental impacts on waste streams, dose, accident analyses, and fuel cycle and transportation factors. The following is a general description of the waste treatment streams at QCNPS and an evaluation of the environmental impacts.

Radioactive Waste Stream Impacts

QCNPS uses waste treatment systems designed to collect, process, and dispose of radioactive gaseous, liquid, and solid waste in accordance with the requirements of 10 CFR Part 20 and Appendix I to Part 50. These radioactive waste treatment systems are discussed in the FES. The proposed EPU would not affect the environmental monitoring of these waste streams or the radiological monitoring requirements contained in licensing basis documents. The proposed EPU would not result in changes in operation or design of equipment in the gaseous, liquid, or solid waste systems. The proposed EPU would not introduce new or different radiological release pathways and would not increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release. The staff evaluated specific effects of the proposed EPU on changes in the gaseous, liquid, and solid waste streams as a radiological environmental impact to the proposed EPU.

Gaseous Radioactive Waste:

During normal operation, the gaseous effluent systems control the release of gaseous radioactive effluents to the site environs, including small quantities of activation gases and noble gases, so that routine offsite releases are below the limits of 10 CFR Part 20 and Appendix I to Part 50 (10 CFR Part 20 includes the requirements of 40 CFR Part 190). The major sources of gaseous radioactive wastes at QCNPS are the condenser air ejector effluent and the steam packing exhaust system effluent. Based on the conservative assumption of a non-negligible amount of fuel leakage due to defects, the licensee stated that radioactive release volumes would increase proportionally with the 18 percent EPU conditions. The current and expected fuel defect rate is extremely small and the expected radioactive gaseous effluents under the EPU conditions would be within the Appendix I limits. Therefore, the conclusions in the FES will continue to apply under the EPU conditions.

The licensee does not expect increases in gaseous waste from new fuel designs. The licensee's contract with General Electric contains a warranty section that requires General Electric to meet a specified level of fuel performance. This level is at least as stringent as that imposed on current fuel designs.

Liquid Radioactive Waste:

The liquid radwaste system is designed to process and recycle, to the extent practicable, the liquid waste collected so that annual radiation doses to individuals are maintained below the guidelines in 10 CFR Part 20 and 10 CFR Part 50, Appendix I. Liquid radioactive wastes at QCNPS include liquids from the reactor process systems and liquids that have become contaminated with process system liquids. Increases in flow rate through the condensate demineralizer and increase of fission products and activated corrosion products are expected under the EPU conditions. This would result in additional backwashes of condensate demineralizers and reactor water cleanup filter demineralizers. These additional backwashes would be processed through the liquid radioactive waste treatment system and are expected to be suitable for reuse. Therefore, liquid effluent release volumes are not expected to increase significantly as a result of the EPU. No changes in the liquid radioactive waste treatment system are proposed. Average treatment efficiency would not change; however radioactivity level of liquid effluent releases may increase with the 18 percent EPU. These liquid effluents from QCNPS would be within the regulatory limits of 10 CFR 50, Appendix I.

Based on information submitted by the licensee, the staff concludes that no significant dose increase in the liquid pathway would result from the proposed EPU. Therefore, the conclusions in the FES would remain valid under the EPU conditions.

Solid Radioactive Waste Impacts:

Solid radioactive wastes include solids recovered from the reactor process system, solids in contact with the reactor process system liquids or gases, and solids used in the reactor process system operation. The largest volume of solid radioactive waste at QCNPS is low-level radioactive waste (LLRW). Sources of LLRW at QCNPS include resins, filter sludge, dry active waste, metals, and oils. The annual burial volume of LLRW generated in 1998 was 228.61 cubic meters; in 1999, the burial volume decreased to 82.93 cubic meters, and the projected burial volume of LLRW for 2000 is approximately 140 cubic meters. A one-time increase in the burial volume of LLRW would be associated with the EPU. The volume of resin is expected to increase by as much as 18 percent under the EPU conditions, because of the increased amount in iron removed by the condensate system from the increased feedwater flow. Adding the 18 percent increase in the resin volume to the projected year 2000 LLRW burial volume results in a 154-cubic-meter EPU LLRW burial volume per year (an increase in approximately 10 percent), which would be bounded by the FES.

The number of fuel assemblies would increase in any given core load with the proposed EPU, reducing the storage space in the spent fuel pool. At current off-load rates, four dry storage casks would be filled during each refueling outage and a fifth dry storage cask would be partially filled. QCNPS plans to fill the fifth cask using the inventory of assemblies from the spent fuel pool. At the EPU conditions, each refueling outage would also fill four casks and partially fill a fifth. Fewer assemblies from the spent fuel pool would be needed to fill the fifth dry storage cask. The net effect of the EPU would be to increase the number of dry storage casks needed by three to four every 5 years.

Summary:

In summary, the solid radioactive waste burial volume is estimated to increase by approximately 10 percent, the volume of liquid radioactive releases would not be expected to increase, and the volume of gaseous radioactive effluents would be expected to increase up to 18 percent as a result of the proposed EPU. The level of radioactivity of the liquid effluent releases would also increase up to 18-percent. The proposed EPU is not expected to have a significant impact on the volume or activity of radioactive solid wastes at QCNPS.

Dose Impacts

The staff evaluated in-plant and offsite radiation as part of its review of environmental impacts of the proposed EPU.

In-plant Radiation

Radiation levels and associated doses are controlled by the as low as reasonably achievable (ALARA) program, as required by 10 CFR Part 20. The QCNPS ALARA program manages exposure by minimizing the time personnel spend in radiation areas, maximizing the distance between personnel and radiation areas, and maximizing shielding to minimize radiation levels in routinely occupied plant areas and in the vicinity of plant equipment requiring attention. Exelon has determined that the current shielding designs are adequate for any dose increase that may occur due to the proposed EPU. Normal operation radiation levels would increase by no more than the percentage increase of the EPU. Many aspects of the plant were originally designed for higher-than-expected radiation sources. The increase in radiation level does not affect radiation zoning or shielding in the various areas of the plant because it is offset by conservatism in the original design, source terms assumptions, and analytical techniques. The licensee states that no new dose reduction programs would be implemented and the ALARA program would continue in its current form.

A potential source of increased occupational radiation is the projected increase in moisture carryover from the reactor vessel steam dryer/separator to the main steam lines. To reduce moisture content under the EPU conditions, modifications to the steam dryer/separator would be required. The modifications are expected to result in a negligible increase in occupational exposure.

On the basis of the above information, the staff concludes that the occupational (in-plant) dose for QCNPS following the proposed EPU would be bounded by the dose estimates in the FES.

Offsite Dose:

The slight increase in normal operational gaseous activity levels under the EPU would not affect the large margin to the offsite dose limits established by 10 CFR Part 20. Offsite dose from radioactive effluents are reported in the Annual Radiological Environmental Operating Reports. For the period from 1995 to 1999, the average annual whole body dose was 5.23E-4 millirem and the average annual dose to the critical organ was 8.17E-4 millirem. The highest percentage of 10 CFR Part 50, Appendix I, regulatory limits for maximum dose resulting from liquid releases to an adult for the 5 year period occurred in 1998 and was 0.005 percent of the critical organ dose limit. For the 1995-1999 period, the average dose was 0.003 percent of the 10 CFR Part 50, Appendix I, regulatory limits. No significant change in the volume of water treated and released is expected. The offsite dose from liquid effluents is projected to increase proportionally with the EPU due to an increase in the concentration of fission products and activation products in the reactor coolant. The licensee states that offsite dose would remain below the 10 CFR 50, Appendix I, regulatory limits.

Dose to individuals from gaseous releases are also reported in the Annual Radiological Environmental Report. The average annual total body dose during the period of 1995 to 1999 was 7.08E-4 millirem and the average annual dose to the critical organ was 3.9E-2 millirem.

The highest percentage of 10 CFR Part 50, Appendix I, regulatory limits for maximum dose resulting from airborne releases to an adult during the period of 1995 to 1999 occurred in 1997 and was 0.23 percent of the critical organ dose limit. From the period of 1995 to 1999, the average dose was 0.16 percent of the Appendix I regulatory limits. Conservatively assuming a non-negligible amount of fuel leakage due to defects, gaseous effluents will increase proportionally to the 18 percent EPU; however, offsite dose will remain well below 10 CFR Part 50, Appendix I, regulatory limits.

The calculated offsite dose resulting from direct radiation due to radiation levels in plant components, such as sky shine, will increase up to 18 percent because the Offsite Dose Calculation Manual conservatively adjusts offsite dose to power generation level. Because sky shine is the dominant contributor to total offsite dose, the calculated total offsite dose, based on calculations from the Offsite Dose Calculation Manual, will increase up to 18 percent. Actual offsite dose from sky shine is not expected to increase significantly because the decreased transit time is expected to result in a minimal change in concentration through reduced decay time and because expected activity concentration in the steam will remain constant due to the dilution effect of a 19 percent increase in steaming rate. The expected dose at the EPU conditions would remain below the limits of 10 CFR Part 50, Appendix I, 10 CFR Part 20, and 40 CFR Part 190 standards.

The EPU would not create new or different sources of an offsite dose from QCNPS operation, and radiation levels under the proposed EPU conditions would be within the regulatory limits. The staff concludes that the estimated offsite doses under the EPU conditions would meet the design objectives specified by 10 CFR Part 50, Appendix I, and be within the limits of 10 CFR Part 20.

Accident Analysis Impacts

The staff reviewed the assumptions, inputs, and methods used by Exelon to assess the radiological impacts of the proposed EPU at QCNPS. In doing this review, the staff relied upon information placed on the docket by Exelon, staff experience in doing similar reviews, and the staff-accepted licensing topical reports NEDC-32424P-A (Proprietary), "Generic Guidelines for General Electric Boiling Water Reactor (BWR) Extended EPU," February 1999 (known as ELTR1), and NEDC-32523P-A (Proprietary), "Generic Evaluation of General Electric Boiling Water Reactor Extended EPU," February 2000 (known as ELTR2). The staff finds that Exelon used analysis methods and assumptions consistent with the conservative guidance of ELTR1 and ELTR2. The staff compared the doses estimated by Exelon to the applicable criteria. The staff finds, with reasonable assurance, that the licensee's estimates of the exclusion area boundary (EAB), low-population zone (LPZ), and control room doses will continue to comply with 10 CFR Part 100 and 10 CFR Part 50, Appendix A, GDC-19, as clarified in NUREG-0800, Sections 6.4 and 15. Therefore, QCNPS operation at the proposed EPU rated thermal power is acceptable with regard to the radiological consequences of postulated design basis accidents.

Fuel Cycle and Transportation Impacts

The environmental impact of the uranium fuel cycle has been generically evaluated by the staff for a 1000 MWe reference reactor and is described in Table S-3 of 10 CFR 51.51. The QCNPS reactors are proposed to operate at 912 MWe after the implementation of the EPU and Table S-3 reasonably bounds the environmental impacts of the uranium fuel cycle for each QCNPS reactor. The radiological effects presented in Table S-3 are small and would not be expected to change due to the implementation of the EPU.

The environmental impacts of the transportation of nuclear fuel and wastes are described by Table S-4 of 10 CFR 51.52. The table lists heat and weight per irradiated fuel cask in transit, traffic density, and individual and cumulative dose to workers and the general

population under normal circumstances. The regulations require that environmental reports contain either (a) a statement that the reactor meets specified criteria, in which case its environmental effects would be bounded by Table S-4; or (b) further analysis of the environmental effects of transportation of fuel and waste to and from the reactor site.

An NRC assessment (53 FR 30355, dated August 11, 1988, as corrected by 53 FR 32322, dated August 24, 1988) evaluated the applicability of Tables S-3 and S-4 to higher burnup cycles and concluded that there would be no significant change in environmental impacts for fuel cycles with uranium enrichments up to 5 weight percent uranium-235 and burnups less than 60,000 megawatt-day per metric ton of uranium (MWd/MTU) from the parameters evaluated in Tables S-3 and S-4. Because the fuel enrichment for the EPU would not exceed 5 weight percent uranium-235 and the rod average discharge exposure would not exceed 60,000 MWd/MTU, the environmental impacts of the proposed EPU at QCNPS would remain bounded by these conclusions and would not be significant.

Summary

The proposed EPU would not significantly increase the probability or consequences of accidents, would not introduce new radiological release pathways, would not result in a significant increase in occupational or public radiation exposures, and would not result in significant additional fuel cycle environmental impacts. Accordingly, the Commission concludes that there are no significant radiological environmental impacts associated with the proposed action. Table 2 summarizes the radiological environmental impacts of the EPU at QCNPS.

Table 2. Summary of Radiological Environmental Impacts of the EPU at QCNPS

Impacts	Impacts of the EPU at QCNPS
Radiological Waste Stream Impacts	The gaseous radioactive release volume would increase proportionally with the power increase. The liquid radioactive release volume is not expected to increase; however, activity levels would increase proportionally with the power increase. Solid radioactive waste will increase approximately 8 percent. Releases would be within regulatory limits.
Dose Impacts	In-plant radiation levels would increase by 18 percent and dose would be maintained ALARA. Offsite dose from liquid and gaseous effluents may increase up to 18 percent. Calculated dose from sky shine will increase up to 18 percent. In-plant and offsite dose would remain within the regulatory limits.
Accident Analysis Impacts	No significant increase in probability or consequences of accident.
Fuel Cycle and Transportation Impacts	No significant increase. Impacts would remain with the conclusions of Table S-3 and S-4 of 10 CFR Part 51.

Environmental Impacts of the Alternatives to the Proposed Action

As an alternative to the proposed action, the staff considered denial of the proposed action (i.e., “the no-action” alternative). Denial of the application would result in no change in current environmental impacts in the QCNPS vicinity; however, other generating facilities using nuclear or other alternative energy sources, such as coal or gas, would be built in order to supply generating capacity and power needs. Construction and operation of a coal plant would create impacts to air quality, land use and waste management. Construction and operation of a gas plant would also impact air quality and land use. Implementation of the EPU would have less of an impact on the environment than the construction and operation of a new generating facility and does not involve new environmental impacts that are significantly different from

those presented in the FES. Therefore, the staff concludes that increasing QCNPS capacity is an acceptable option for increasing power supply. Furthermore, unlike fossil fuel plants, QCNPS does not routinely emit sulfur dioxide, nitrogen oxides, carbon dioxide, or other atmospheric pollutants that contribute to greenhouse gases or acid rain.

Alternative Use of Resources

This action does not involve the use of any different resources than those previously considered in the QCNPS FES, dated 1972.

Agencies and Persons Consulted

In accordance with its stated policy, on November 9, 2001, prior to issuance of this environmental assessment, the staff consulted with the Illinois State official, Frank Niziolek, of the Illinois Department of Nuclear Safety, regarding the environmental impact of the proposed action. The State official had no comments.

FINDING OF NO SIGNIFICANT IMPACT

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's application dated December 27, 2000, as supplemented by letters dated February 12, April 6 and 13, May 3, 18, and 29, June 5, 7, and 15, July 6 and 23, August 7, 8, 9, 13 (two letters), 14 (two letters), 29, and 31 (two letters), September 5 (two letters), 14, 19, 25, 26, and 27 (two letters), and November 2, 2001 (two letters). Documents may be examined and/or copied for a fee, at the NRC's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the

ADAMS Public Library component on the NRC Web site, http://www.nrc.gov (the Electronic Reading Room). If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS,

contact the NRC Public Document Room (PDR) Reference staff at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr@nrc.gov.

Dated at Rockville, Maryland, this 9th day of November 2001.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Jon B. Hopkins, Acting Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation