

February 7, 2002

Mr. Oliver D. Kingsley, President
and Chief Nuclear Officer
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
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SUBJECT: CLINTON POWER STATION, UNIT 1 - DRAFT ENVIRONMENTAL
ASSESSMENT AND FINDING OF NO SIGNIFICANT IMPACT RELATED TO A
PROPOSED LICENSE AMENDMENT TO INCREASE THE LICENSED POWER
LEVEL (TAC NO. MB2210)

Dear Mr. Kingsley:

Enclosed is a copy of the Environmental Assessment and Finding of No Significant Impact related to the application from AmerGen Energy Company, LLC, dated June 18, 2001, for amendment to Clinton Power Station (CPS).

The proposed amendment would allow AmerGen to increase its electrical generating capacity at CPS by raising the maximum thermal power level from 2894 megawatts thermal (MWt) to 3473 MWt. This change represents an increase of approximately 20 percent above the current licensed power for CPS. The proposed amendment would also change the operating license and the technical specifications appended to the operating license to provide for implementing uprated power operation.

The application was supplemented by letters dated September 7 and 28, October 17, 23, 26, and 31, November 8 (2 letters), 20, 21, 29, and 30, and December 5, 6, 7, 13 (2 letters), 20, 21, and 26, 2001, and January 8, 15, 16, and 24, 2002.

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

Sincerely,

/RA/

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

Docket No. 50-461

Enclosure: Environmental Assessment

cc w/encl: See next page

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ACCESSION NO: ML020290082

*See previous concurrence

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DATE	02/7/2002	02/7/2002	02/06/2002	02/7/2002

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Oliver D. Kingsley

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UNITED STATES NUCLEAR REGULATORY COMMISSION
AMERGEN ENERGY COMPANY, LLC
DOCKET NO. 50-461
CLINTON POWER STATION, UNIT 1
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) as its evaluation of a request by AmerGen Energy Company, LLC (AmerGen or the licensee), for a license amendment to increase the maximum thermal power level at Clinton Power Station, Unit 1 (CPS), from 2894 megawatts thermal (MWt) to 3473 MWt. This represents a power increase of approximately 20 percent for CPS. The proposed amendment would also change the operating license and the technical specifications appended to the operating license to provide for implementing uprated power operation. 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 CPS; 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 March 15, 2002. 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 March 15, 2002.

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/reading-rm/Adams.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. 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.

FOR FURTHER INFORMATION CONTACT: Jon B. Hopkins, Office of Nuclear Reactor Regulation, at Mail Stop O-7 D3, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, by telephone at (301) 415-3027, or by e-mail at jbh1@nrc.gov.

SUPPLEMENTARY INFORMATION:

The U. S. Nuclear Regulatory Commission (NRC) is considering issuance of an amendment to Facility Operating License No. NPF-62, issued to AmerGen Energy Company, LLC (AmerGen, the licensee) for the operation of the Clinton Power Station, Unit 1 (CPS), located on Clinton Lake in DeWitt County, Illinois. Therefore, pursuant to 10 CFR 51.21 and 51.35, 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 AmerGen, the operator of CPS, to increase its electrical generating capacity at CPS by raising the maximum reactor core power level from 2894 MWt to 3473 MWt. This change is approximately 20 percent above the current licensed maximum power level for CPS. 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. CPS 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 licensee with input from the plant designer, General Electric Company, evaluated the proposed EPU from a safety perspective and concluded that sufficient safety and design margins exist so that the proposed increase in core thermal power level can be achieved without any risk to health and safety of the public or impact on the environment.

The proposed action is in accordance with the licensee's application for amendment dated June 18, 2001, a letter providing initial environmental information dated September 7, 2001, and additional environmental information provided in a letter dated November 29, 2001. Also, the application was supplemented by letters dated September 28, October 17, 23, 26, and 31, November 8 (2 letters), 20, 21, and 30, and December 5, 6, 7, 13 (2 letters), 20, 21, and 26, 2001, and January 8, 15, 16, and 24, 2002. The proposed amendment would change the operating license and the technical specifications appended to the operating license to provide for implementing uprated power operation.

The Need for the Proposed Action:

AmerGen evaluated the need for additional electrical generation capacity in its service area for the planning period 2000-2009. Information provided by the North American Electric Reliability Council showed that, in order to meet projected demands, generating capacity must be increased by at least 1.6% per year for the Mid-Continent Area Power Pool (MAPP) and the Mid-America Interconnected Network (MAIN).

AmerGen determined that a combination of increased power generation and purchase of power from the electrical grid would be needed to meet the projected demands including an operating margin for reliability. Increasing the generating capacity at CPS was estimated to provide lower cost power than can be purchased on the current and projected energy market. In addition, increasing nuclear generating capacity would lessen the need to depend on fossil fuel alternatives that are subject to unpredictable cost fluctuations and increasing environmental costs.

Environmental Impacts of the Proposed Action:

At the time of the issuance of the operating license for CPS, the NRC staff noted that any activity authorized by the license would be encompassed by the overall action evaluated in the Final Environmental Statement (FES) for the operation of CPS, which was issued in May 1982. The original operating license for CPS allowed a maximum reactor power level of 2894 MWt. On September 7, 2001, 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 CPS. Based on the staff's independent analyses and the evaluation performed by the licensee, the staff concludes, as described further below, 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. Additionally, no changes to any State

permit limits would be necessary. This environmental assessment first discusses the non-radiological and then the radiological environmental impacts of the proposed EPU at CPS.

NON-RADIOLOGICAL IMPACTS AT CPS

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

Land Use Impacts

The EPU at CPS as proposed will require no changes to the current use of land. Modification plans as submitted do not include building any new structures or materially altering any existing structures to implement EPU activities. With the exception of transportation of equipment and materials, and routine waste disposal, EPU activities will be confined to the area within the plant security fence. Capacity of above or below ground storage tanks are not scheduled to be changed by the EPU. Areas outside the plant security fence would not be affected in any way by the EPU implementation plan as submitted by AmerGen.

The CPS EPU includes replacement of turbine components that will be radiologically contaminated. The proposed maintenance plan includes decontamination and recycling of replaced turbine parts, or transfer to an approved offsite disposal facility. Thus, additional on-site, low-level radioactive waste storage facilities would not be needed. We conclude that the NRC staff's conclusions in the FES on land use would remain valid as a result of implementing the proposed EPU.

Water Use Impacts

No groundwater resources will be affected by the EPU. CPS uses the impounded volume of Clinton Lake (surface water) for all cooling water requirements. The licensee has stated that the EPU will result in a minimal change in the consumptive use of water from the lake. Thus, the NRC staff's conclusions in the FES on water use would continue to be valid

under operating conditions expected after the EPU. Also note that in its October 1974 environmental statement for the construction of two units at the Clinton site, the NRC evaluated consumptive use of the lake water with two units operating.

Discharge Impacts

The NRC staff evaluated environmental impacts associated with the proposed EPU cooling water discharge such as fogging, icing, noise, lake water temperature changes, and cold shock.

Cooling Lake Fog and Icing

Environmental impacts such as fogging and icing could result from the increased heat load resulting from discharge of additional cooling water into Clinton Lake. However, the CPS Environmental Report addressed estimates of ground fog frequency and icing and associated environmental impacts for the current power level. These analyses included considerable conservatism, well beyond the projected 20% increase of release heat. The NRC staff concluded in the FES that the operation of the CPS cooling water discharge system was not harmful to the lake and surrounding environment. The NRC staff concludes that ground fog and icing that might be generated by plant operation at the uprated power level is bounded by the conclusions of the FES.

Noise

No significant changes to facilities are planned that would change the character, sources or energy of noise generated at CPS. All new equipment or components needed to modifying existing equipment in order to effect the EPU will be installed within existing plant facilities. No significant increase in ambient noise levels is anticipated in any work areas within the plant. The upgraded turbines are designed to operate at the same speed as under the

existing power level. The conclusions regarding noise levels in the Environmental Report remain applicable for noise levels expected under EPU conditions.

Lake Water Temperature Changes

Effluent from the circulating water coolant system is directed back to Clinton Lake. The licensee has stated that it does not expect any increase in circulating water flow as a result of the EPU. However, because more heat must be rejected from the plant, circulating water discharge temperatures will be elevated as a result of the EPU. The Illinois Environmental Protection Agency (IEPA) has established limits for this effluent in the plant's National Pollutant Discharge Elimination System (NPDES) permit in order to protect the resource. The licensee has stated that the plant will continue to be operated in compliance with established limits in the NPDES permit. Consequently, there should not be a thermal impact to the lake as a result of the EPU in excess of that already considered by IEPA. If the NPDES limits prevent operation at full power under some conditions, the licensee will either have to derate the unit during those times or request a change to its permit.

Cold Shock

Cold water shock to aquatic species occurs when the warm water discharge from a plant stops due to an unplanned shutdown. The probability of an unplanned shutdown is independent of the power uprate. In the event of a shutdown the thermal differential will still be within the NPDES limits. Consequently, the increase in the risk of fish mortality due to cold shock will not be significant, and the total impact will continue to be bounded by the FES.

Terrestrial Biota

The FES for CPS published in May 1982 identified two endangered species that may occur in the vicinity of the site; the bald eagle (*Haliaeetus leucocephalus*) and the Indiana bat (*Myotis sodalis*). Operation of the CPS under EPU conditions is expected to have no adverse effect on land use and will not disturb the habitats of any terrestrial plant or animal species as

evaluated in the FES. Extended power uprate operating conditions will not significantly increase previously evaluated environmental impacts on terrestrial biota.

Aquatic Biota

As discussed previously, the licensee has stated that it does not expect to have to increase circulating water flow as a result of the EPU. Therefore, there should be no increase in the entrainment and impingement of aquatic species at the intake structure. In addition, the licensee has indicated that it expects the discharge temperature of the water to remain within the limits previously evaluated and approved by IEPA. As long as the plant is operated within these limits, impacts to aquatic species should not exceed those previously considered.

Human Health

In response to an NRC staff request for additional information, CPS submitted the following information regarding *Naegleria fowleri* in its letter dated November 29, 2001.

During the final regulatory review of the Final Environmental Statement (FES) in 1982, concerns were raised that the elevated temperatures in Clinton Lake due to plant operation might increase the abundance of pathogenic *N. fowleri* and constitute a risk for primary contact water sports. *N. fowleri* is the organism that causes a potentially fatal disease known as Primary Amoebic Meningoencephalitis (PAM). Initially, the Illinois Department of Public Health (IDPH) responded to concerns raised by the Illinois Department of Natural Resources (IDNR) and asked for a two-year pre- and post-operational monitoring program for *N. fowleri* and proposed a ban on primary water contact water sports once the plant went operational. After further review of the initial monitoring studies and projected lake temperatures, and a specially funded medical school review of the risks, the IDPH issued a letter in 1987 stating that there was no reason to restrict primary contact water sports. The IDPH, however requested additional *Naegleria fowleri* monitoring and lake temperature data collection by CPS. The monitoring program continued through 1990, when it was concluded that no further information was needed and

that the risk of *N. fowleri* from Clinton Lake was insignificant relative to other public health risks.

The summary of the monitoring program results listed below illustrates two critical findings. The first was *N. fowleri* did exist in Clinton Lake prior to any thermal additions, and second, as expected, it was detected more frequently after thermal additions. However, even during the operational years, the frequency of *N. fowleri* in Clinton Lake was much lower than that found in ambient temperature lakes in Florida. *N. fowleri* is common in most fresh water lakes in Florida.

CPS <i>Naegleria fowleri</i> Monitoring Program Summary				
year	Researcher	CPS Status	Total # Of Samples	Positive for <i>Naegleria fowleri</i>
1983	Dr. Tyndall (Oak Ridge Nat. Labs)	Pre-operational	82	0
1984	Dr. Tyndall (Oak Ridge Nat. Labs)	Pre-operational	120	0
1986	Dr. Wellings & Dr. Lewis (Fla. D.H&RS)	Pre-operational	219	1
1987	Dr. Wellings & Dr. Lewis (Fla. D.H&RS)	Start-up	103	0
1986	Dr. Huizinga (IL State University)	Pre-operational	123	1
1987	Dr. Huizinga (IL State University)	Start-up	148	2
1988	Dr. Huizinga (IL State University)	Operational	400	21
1989	Dr. Huizinga (IL State University)	Operational	176	9
1990	Dr. Huizinga (IL State University)	Operational	400	15

An increase in abundance of *Naegleria fowleri* does not directly correlate with an increase in the number of cases of PAM caused by this pathogen. As of 1998, there had only been about 54 documented cases of PAM in the entire country. Most of these cases were in Florida and a small isolated region of Virginia. The only case associated with a cooling lake was in Texas, and the victim contracted PAM from a non-heated portion of the lake.

Efforts were made to keep the IDPH informed of the *N. fowleri* monitoring results and operational changes that impacted lake temperatures. Each year the IDPH was given the *N. fowleri* monitoring data and temperature data from continuous recorders at key locations in Clinton Lake. When Illinois Power filed a petition in 1988 for a Site-Specific Adjusted Standard for higher thermal discharge limits, the IDPH was given a presentation on the modeled lake temperatures that would result from this Site-Specific Standard. The Site-Specific Standard was granted in 1992 and permitted the maximum daily average discharge temperature to be raised from 99°F to 110.7°F. The Station NPDES permit currently has two temperature limitations. The temperature of discharge water at the second drop structure in the discharge flume is limited to a maximum daily average temperature of 99°F for 90 days in a calendar year, or 110.7°F for any single day. The permit and these limits will not be changed for the EPU, therefore, the reviewed and approved heat load for Clinton Lake will not be changed.

The original monitoring program and subsequent decisions to stop monitoring and permit unrestricted recreational lake use were based on compliance with the NPDES permit and the very small risk this issue presented. Based on the above discussion, the NRC staff believes that the risk to the public associated with the microbial pathogen *N. fowleri* in the reservoir will not increase significantly and no use restrictions or additional monitoring are necessary due to power uprate operation.

Transmission Facility Impacts

Environmental impacts, such as the installation of additional transmission line equipment, or increased exposure to electromagnetic fields (EMF) and electrical shock, could result from an EPU. The licensee stated that there are no changes in operating transmission or power line right of way needed to support the EPU. An increase in main transformer capacity will be necessary to deliver the additional power to the grid but design safety margins are more

than adequate to handle this increased electrical power. No new equipment or modifications will be necessary for the offsite power system to maintain grid stability.

The probability of shock from primary or secondary current systems does not increase from an EPU. Transmission lines and facilities are designed in accordance with the applicable shock prevention provisions of the National Electric Safety Code, and engineered safety margins are deemed adequate to protect against potential electric shock. The increased generator output at CPS will cause a proportional increase in the intensity of EMFs in the vicinity of the near plant transmission lines. There is no scientific consensus regarding the health effects, in any, of exposure to electromagnetic fields. No known effects from EMF on terrestrial biota have been demonstrated. Exposure to EMFs from offsite transmission system power level increases would not be expected to increase significantly, and no health or environmental impacts have been shown to result from EMF exposure. Thus no significant environmental impacts from changes in the transmission design and equipment are expected, and the conclusions in the FES remain valid.

Social and Economic Effects

The NRC staff received information provided by the licensee regarding socioeconomic impacts from the planned EPU, including potential impacts on the CPS workforce and the local economy. The licensee does not anticipate that the EPU will affect the size of the CPS permanent workforce, and does not expect any need to expand the labor force required for future outages. CPS contributions to the local, state and school tax bases are of significant value to the local economy. Some fraction of the plant modification costs to accommodate the EPU will accrue to the economy. Increased revenue from sale of additional power output will expand the local tax revenue, benefitting the community directly.

Benefits to the local community are dependent in part on the success of the EPU, and the extent to which the EPU will permit AmerGen to remain competitive in the energy market.

To the extent that the EPU will extend the operating lifetime of CPS by enhancing its economic performance, the long term benefits to the local economy will be extended. The staff expects that the conclusions in the FES regarding social and economic impacts will apply to EPU operating conditions.

In summary, the proposed EPU at CPS is not expected to cause a significant change in non-radiological impacts on land use, water use, waste discharges, noise, terrestrial and aquatic biota, transmission facilities or social and economic factors, and would have no non-radiological environmental impacts in addition to those evaluated in the FES. Table 1 summarizes the non-radiological environmental effects of the EPU at CPS.

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

Impacts	Impacts of the EPU at CPS
Land Use Impacts	No changes required to current land use
Water Use Impacts	Minimal increase in consumptive water use expected
Discharge Impacts	Any increases in fog formation or icing are expected to be insignificant and well within the acceptable levels determined by the FES. No significant increases in ambient noise levels are expected. No plans to increase cooling water flow Discharge temperature will remain within NPDES limits Lake water temperature changes both during normal operations and after unplanned shutdown will remain within accepted levels
Terrestrial Biota Impacts	No wildlife habitat in the area will be affected because all construction will be done inside existing facilities. Known endangered species in the area will continue to be monitored
Aquatic Biota Impacts	Temperature change in Lake Clinton is expected to remain within NPDES limits. Risk to the public from known microbial pathogens will not increase significantly
Transmission Facilities Impacts	No changes in operating transmission voltages, onsite transmission equipment, or power line rights-of-way. Transformer capacity will increase but design safety margins considered adequate. EMF will increase proportionate to the EPU but no changes in exposure rate is expected
Social and Economic Impacts	No change in CPS permanent or part-time work force is expected. EPU may expand tax base and enhance longevity of plant operation

RADIOLOGICAL IMPACTS FROM EPU AT CPS

The NRC staff evaluated radiological environmental impacts on waste streams, dose, accident analysis, and fuel cycle and transportation factors. The following is a general discussion of these issues and an evaluation of their environmental impacts.

Radioactive Waste Stream Impacts

CPS uses waste treatment systems that must be designed to collect, process and dispose of radioactive gaseous, liquid and solid waste in a controlled and safe manner, and in accordance with the requirements of 10 CFR Part 20 and Appendix I to Part 50. The design bases for the CPS systems during normal operation limit discharges well within the limits specified in 10 CFR Part 20, "Standards for Protection Against Radiation," and satisfy the design objectives of Appendix I to 10 CFR Part 50, "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." Licensee analysis shows that these limits and objectives will continue to be met under EPU operating conditions.

Modifications planned to effect EPU operation do not include nor require any changes in the operation or design of facilities or equipment in the solid, liquid or gaseous waste handling systems. The safety and reliability of these systems are designed with sufficient margin so as to be unaffected by operating conditions associated with EPU. Neither the environmental monitoring procedures for these waste streams, nor any radiological monitoring requirements of the CPS Technical Specifications and/or Offsite Dose Calculation Manual will be reduced or changed in any way by the EPU.

The EPU will not introduce any new or different radiological release pathways. Probability of operator error or equipment malfunction that might result in an uncontrolled radioactive release are estimated to remain at current levels under EPU conditions. The specific effects of EPU on each of the radioactive waste systems are discussed below.

Solid Waste

Solid radioactive wastes include solids recovered from the reactor process system, solids in contact with the reactor process system liquids or gasses, and solids used in reactor process system operation. The largest volume of solid radioactive waste at CPS is low-level radioactive waste (LLRW). Sources of LLRW at CPS include resins, filter sludge, dry active waste, metals and oils.

The annual environmental impact of low-and high-level solid wastes related to uranium fuel cycle activities was generically evaluated by the NRC staff for a 1000 MWe reference reactor. The estimated activity content of these wastes is given in Table S-3 in 10 CFR 51.51 and would continue to be bounding for CPS at EPU operating conditions.

CPS maintains records of the volume of solid waste generated and has a documented volume reduction program with the objective to continually identify and implement volume reduction techniques. The low-level solid waste volume generated at CPS in calendar year 2000 was reported to be 111.7 cubic meters. For calendar year 2001, CPS is projecting 115 cubic meters of low-level solid waste. With volume reduction programs in effect, CPS is estimating far less than a 20 percent increase in solid waste volume due to the planned EPU.

The largest volume source of radioactive solid waste is spent resins from process wastes. Other major contributors at CPS are equipment wastes from operational and maintenance procedures, and chemical and reactor system wastes. The EPU is not projected by the licensee to significantly change the amount or type of equipment and chemical wastes generated.

CPS projects an increase in the process wastes generated from operation of the reactor water cleanup (RWCU) filter/demineralizers, and the condensate demineralizers that could be approximately proportional to the power uprate. More frequent system backwashes will occur due to an increase in the flow rate through the RWCU and condensate demineralizer systems.

The licensee estimates the increased frequency of backwashes to be less than 20 percent of current value. The purity of the coolant and filter performance will not change. The licensee projects only a small increase in solid waste volumes from these processes.

Another important source of solid waste is spent fuel. CPS reported that 188 fresh fuel bundles were loaded in the recent refueling outage, to accommodate operation under EPU conditions. The number of irradiated fuel assemblies moved to storage during future refueling outages is not expected to increase as a result of EPU because of planned and approved extended burnup and increased U-235 enrichment of the fuel used. The amount of these wastes, therefore, is not expected to increase. The spent fuel is currently stored in spent fuel facilities onsite and is not shipped offsite.

The volume and activity of waste predicted by the licensee to be generated from spent control blades and in-core ion chambers may increase slightly as a result of higher neutron flux conditions associated with EPU conditions. The NRC staff does not expect this increase to be significant and believes that it can be accommodated within existing onsite storage facilities. Therefore, the NRC staff concludes that there will not be a significant increase in the amounts, or change in the types, of solid wastes produced by the plant as a result of EPU.

Liquid Radwaste

The liquid radwaste system at CPS is designed to process and recycle the liquid waste collected so that annual radiation doses to individuals are maintained will below the guidelines in 10 CFR Part 20 and 10 CFR Part 50, Appendix I. CPS has operated since 1992 as a zero radioactive liquid release plant, choosing to recycle all liquid wastes. CPS does not intend to change this policy as a result of EPU. Filter backwashing will increase input to the liquid radwaste system due to the 20 percent EPU, but this small increase will be recycled rather than discharged, and thus will have no effect on the environment.

CPS does not expect the EPU to result in any significant increase in the volume of liquid wastes from other sources into the liquid radwaste system. The reactor will continue to operate within present fluid pressure control bands under EPU conditions so that leakage should not increase. No changes in reactor recirculation pump flow rates are needed to accommodate the EPU. Equipment drains, floor drains or chemical waste systems will not be changed as a result of the EPU because the operating conditions of these facilities are independent of power levels.

Gaseous Radwastes

During normal operation, the gaseous effluent systems control the release of gaseous radioactive effluents to the site environment, including small quantities of activated 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 releases at CPS are the common station heating, ventilation and air conditioning (HVAC) stack and the standby gas treatment system (SGTS) vent. Normal gaseous releases are through the common station HVAC stack. The radioactive gaseous effluents include small quantities of noble gases, halogens, particulates and tritium. Based on conservative assumptions of non-negligible fuel leakage due to defects, it is probable that gaseous radioactive release rate from the common station HVAC stack would increase in proportion to the 20 percent EPU. Current release quantities are very small and the projected radioactive gaseous effluents under EPU condition would remain within Appendix I limits.

The licensee is required to continually monitor radioactive releases in this pathway to assure that doses to members of the public are maintained within federal limits. The stack effluent alarm setpoint for the stack monitoring system is set conservatively at a level required

to maintain the 10 CFR Part 20 limits as specified by CPS Technical Specifications. The setpoint is $3.8 \text{ E-04 } \mu \text{ Ci/sec}$. Continuous releases at this level would result in offsite doses well below 10 CFR Part 20 limits.

The FES for CPS predicted 6600 curie (ci)/yr noble gas and a 0.46 Ci/yr Iodine -131 release rates. The actual release quantities measured and reported by the licensee for the year 2000 were 5.44 E-03 Ci of noble gases and 1.73 E-04 Ci Iodine -131. Assuming a proportional increase of 20 percent in these rates due to the EPU, the new actual release rates would still be well below those previously evaluated by the FES.

Particulate and tritium release rates evaluated for environmental impact in the FES were 1.75 Ci/yr and 57 Ci/yr, respectively. The actual release quantities measured and reported by CPS for the year 2000 were 3.32 E-03 Ci and 41.64 Ci respectively. The FES quantities are calculated to contribute insignificantly to public dose. Assuming a 20 percent proportional increase due to the EPU, the resulting particulate and tritium release rates will continue to be within the quantities evaluated in the FES as contributing little environmental impact.

The staff concludes that, based on information provided by the licensee and on evaluations performed in the FES, the gaseous effluent levels at EPU operating conditions will remain negligible, and in compliance with release limits of 10 CFR Part 20 and the guidelines of Appendix I of 10 CFR Part 50.

In summary, the NRC staff concludes that the increases projected in solid and gaseous radioactive wastes that are released offsite will comply with federal guidelines and will be well within the FES evaluations.

Radiation Levels and Dose Impacts

The NRC staff evaluated licensee projected in-plant and offsite radiation doses as a part of the review of environmental impacts of the proposed EPU at CPS.

In-Plant Radiation Impacts

On-site radiation levels and associated occupational doses are controlled by the licensee's program to maintain doses as low as reasonably achievable (ALARA) as required in 10 CFR Part 20. The CPS ALARA program manages occupational dose by minimizing the time workers spend in radiation areas, maximizing distance between workers and sources, and using shielding to reduce radiation levels in work areas whenever practical. The licensee has determined that current shielding designs are adequate to compensate for any increases in dose levels as a result of the EPU.

Data provided by CPS shows that occupational dose to workers decreased significantly over the past 10 years. Based on a rolling three year average, the 2001 dose is projected to be 32 percent less than the 1990 dose. Although the EPU will potentially increase radiation levels in some parts of the work area, these increases will be compensated by continued ALARA program improvements and a continuing downward trend in occupational doses is projected by CPS.

CPS shielding design was conservative with respect to projected radiation source levels. In the original shielding analysis, concentrations of fission and corrosion products in reactor coolant water were assumed to be $2.5 \mu\text{Ci/g}$ and $0.062 \mu\text{Ci/g}$, respectively. The actual measured combined concentration is approximately $0.016 \mu\text{Ci/g}$. Assuming a proportional increase of 20 percent in operating radioactivity levels, the shielding design will remain bounding with a significant margin at EPU conditions. On the basis of this information, the NRC staff concludes that the expected in-plant radiation doses at CPS following the proposed EPU will be well below regulatory criteria and will not have a significant impact.

Offsite Dose Impacts

As previously discussed under Gaseous Radiological Wastes, CPS expects that the small increase in normal operational gaseous activity levels under EPU conditions will not

appreciably impact the large margin between 10 CFR Part 20 limits and actual measured and reported releases. Doses from liquid effluents are currently zero and the EPU will not result in any changes in liquid radiological waste releases.

The CPS Technical Specifications implement the release guidelines of 10 CFR Part 50, Appendix I, which are well within 10 CFR Part 20 limits. The licensee provided the following table of doses calculated under current conditions compared to projected values under the planned EPU and to Appendix I dose limits. It is apparent that the offsite doses do not change greatly and remain well within the conservative Technical Specification dose limits.

Table 2. Radiological Effluent Doses

	Nominal Values (Year 2000)	EPU Values (Estimated)	10 CFR 50 Appendix I Limit
Noble Gas Gamma Air Dose (mrad)	1.59 E-07	1.91 E-07	10
Noble Gas Beta Air Dose (mrad)	2.04 E-07	2.45 E-07	20
Particulate, Iodine and Tritium (Thyroid) (mrem)	2.93 E-03	3.52 E-03	15

The planned EPU at CPS should not result in any significant increases in offsite doses from gaseous effluents, nor does the planned EPU envision the creation of any new sources of offsite dose. Radioactive liquid effluents are not routinely discharged from CPS. The annual dose contribution from skyshine is based on design basis activities. These doses are considered bounding for EPU and are a small fraction of the 40 CFR Part 190 limit of 25 mrem. The NRC staff concludes that offsite doses will remain well within regulatory limits under operating conditions associated with the EPU.

Accident Analysis Impacts

The NRC staff reviewed the assumptions, impacts and methods used by CPS to assess the radiological impacts of potential accidents when operating under EPU conditions. In

Section 5 of the CPS FES, three classes of postulated accidents were evaluated to determine the associated environmental impact. The licensee provided the following information regarding the impact of EPU on the assumptions and conclusions for the three environmental accident classes evaluated in the FES.

– Class 1: Incidents of Moderate Frequency.

This class is also referred to as anticipated operational occurrences. The FES concluded that any incident of this type would cause releases commensurate with the limits on routine effluents. Because of facility improvements and maintenance, the actual activity concentrations of reactor coolant are considerably less than predicted by the FES. Assuming a 20 percent increase as a result of EPU activity, concentration levels would still be far below FES predictions.

– Class 2: Infrequent Accidents

There are events that might occur once during the lifetime of the plant. The licensee asserts reasonably that the planned EPU does not increase the probability of occurrence or severity of these type events.

The licensee further evaluated the impact of EPU operating conditions on several typical postulated accidents in these two classes. These were off-gas system failure, radwaste storage tank release, small-break loss-of-coolant accident (LOCA), and fuel handling accident. All of these postulated events under EPU conditions were shown to result in doses that were insignificant and well within the bounding conditions of the FES, or to be so unlikely under present or EPU conditions that they do not contribute significantly to environmental impacts.

– Class 3: Limiting Faults

This class of accidents includes large-break LOCA, main steam-line break, and control rod drop accident (CRDA). The licensee modeled and analyzed these design basis accidents under EPU conditions for comparison to regulatory limits. Radiological consequences of these worst case scenarios are limited by 10 CFR Part 100 for offsite doses. These accidents were conservatively analyzed by the licensee assuming an initial power level of 3039 MWt for the LOCA and 2952 MWt for CRDA. Postulated power levels in the analysis were 105 percent and 102 percent respectively of the FES bounding analytical power level of 2894 MWt. The licensee provided the results of these calculations in the following tables. Following a large break LOCA, the SGTS at CPS establishes and maintains a negative pressure in the secondary containment area. Any primary containment leak will be contained within the secondary containment and will be released to the outside only after passing through SGTS, which filters and treats the effluent. All releases from the SGTS are via the SGTS vent.

Table 3. Loss of Coolant Accident

Location	Current Power Level Dose (rem)	EPU Dose (rem)	Regulatory Limit (rem)
EAB Whole Body	11	13.5	25
EAB Thyroid	225	267	300
LPZ Whole Body	3.5	4.5	25
LPZ Thyroid	86	102	300

Table 4. Rod Drop Accident

Location	Current Power Level Dose (rem)	EPU Dose (rem)	Regulatory Limit (rem)
EAB Whole Body	1.8E-02	2.34E-02	6.25
EAB Thyroid	1.6E-01	1.92E-01	75
LPZ Whole Body	5.6E-03	7.28E-03	6.25
LPZ Thyroid	1.8E-01	2.16E-01	75

The results of these analyses indicate that the EPU will not cause off-site accident projected doses to exceed regulatory limits. The NRC staff agrees that the assumptions used in the licensee's analysis are conservative with respect to EPU operating conditions, shielding and dose. Thus, the staff concludes that the radiological consequences of a design-basis accident under EPU conditions are within the acceptance criteria of 10 CFR Part 100 and do not involve any significant impact to the human environment.

Fuel Cycle and Transportation Impacts

The environmental impact of the uranium fuel cycle has been generically evaluated by the NRC staff for a 1000 MWe reference reactor and is discussed in Table S-3 of 10 CFR 51.51. Under EPU conditions CPS will be rated at approximately 1100 MWe. Information provided by the licensee includes the following. The data presented in tables 5-12 (10 CFR 51.51 Table S-3) and 5.5 (10 CFR 51.52 Table S-4) of the FES are based on an average burnup assumption 33,000 MWd/MtU and a U-235 enrichment assumption of 4 wt.%. Under EPU conditions, fuel consumption is expected to increase such that the batch average burnup of the fuel assemblies will be in excess of 33,000 MWd/MtU but less than 62,000 MWd/MtU. To support extended burnup, the U-235 enrichment levels will also increase, but will still be less than 4 wt.%. The NRC has previously evaluated the impact of increased burnup to 62,000 MWd/MtU with U-235 fuel enrichment to 5 wt.% on the conclusions of

Table S-3. Although some radionuclide inventory levels and activity levels are projected to increase, the NRC noted that little or no increase in the amount of radionuclides released to the environment during normal operation was expected. The NRC staff determined that the incremental environmental effects of increased enrichment and burnup on transportation of fuel, spent fuel and waste would not be significant. In addition the NRC staff analysis noted environmental benefits of extended burnup such as reduced occupational dose, reduced public dose, reduced fuel requirements per unit electricity, and reduced shipments. The NRC concluded that the environmental impacts described by Table S-3 would be bounding for an increased burnup rate above that planned for the CPS EPU.

Because the fuel enrichment for the CPS EPU will not exceed 5 weight percent uranium-235 and the rod average discharge exposure will be under the 62,000 MWd/MtU burnup rate previously analyzed by the NRC, the environmental impacts of the planned EPU at CPS will continue to be bounded by their conclusions and would not be significant.

Summary

Based on NRC staff review of licensee submittals and the FES, it is concluded that the proposed CPS 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 exposure, 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. The following table summarizes the radiological environmental impacts of the EPU at CPS.

Table 5. Summary of Radiological Environmental Impact of the EPU at CPS

Impact	Staff Conclusion Regarding Impact
Radiological Waste Stream Impacts:	The increases projected in solid, liquid, or gaseous radioactive wastes are either recycled (liquid), fully contained on site (solid), or are released (gaseous) at levels that comply with Federal guidelines and that are well within the FES evaluation
Dose Impacts:	Both on-site occupational doses and off-site doses will remain well within regulatory guidance and will continue to be bounded by evaluations performed in the FES
Accident Analysis Impacts:	No significant increase in probability or consequences of accidents is expected
Fuel Cycle and Transportation Impacts:	No significant increase is expected. Impacts remain within the guidelines of Table S-3 and Table S-4 of 10 CFR Part 51

Alternatives:

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; however, in the CPS vicinity 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 CPS capacity is an acceptable option for increasing power supply. Furthermore, unlike fossil fuel plants, CPS does not routinely emit sulfur dioxide, nitrogen oxides, carbon dioxide, or other atmospheric pollutants that may contribute to greenhouse gases or acid rain.

Alternative Use of Resources:

This action does not involve the use of any resources different than those previously considered in the CPS FES, dated May 1982.

Agencies and Persons Consulted:

In accordance with its stated policy, on January 28, 2002, prior to issuance of this environmental assessment, the staff consulted with the Illinois State official, Frank Nizidlek, 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 this action, see the application for amendment dated June 18, 2001, as supplemented by letters dated September 7 and 28, October 17, 23, 26, and 31, November 8 (2 letters), 20, 21, 29, and 30, and December 5, 6, 7, 13 (2 letters), 20, 21, and 26, 2001, and January 8, 15, 16, and 24, 2002, which are available for public inspection at the Commission's Public Document Room, located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the Agencywide Documents Access and Management Systems (ADAMS) Public Electronic Reading Room on the Internet at the NRC Web site, <http://www.nrc.gov/NRC/ADAMS/index.html>. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS, should contact the

NRC Public Document Room Reference staff by telephone at 1-800-397-4209, 301-415-4737
or by e-mail to pdr@nrc.gov.

Dated at Rockville, Maryland, this 7th day of February 2002.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

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