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U. S. Nuclear Regulatory Commission
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Washington, D.C. 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Additional Environmental Information Supporting the License Amendment Request to Permit Extended Power Uprate Operation at Clinton Power Station

References:
(1) Letter from J. M. Heffley (AmerGen) to U. S. NRC, "Request for License Amendment for Extended Power Uprate Operation," dated June 18. 2001.
(2) Letter from J. B. Hopkins (U.S. NRC) to O. D. Kingsley (Exelon Nuclear), "Clinton Power Station, Unit 1 – Extended Power Uprate (TAC No. MB2210)," dated July 30, 2001.

In Reference 1, AmerGen Energy Company, LLC (i.e., AmerGen) submitted a request for changes to the Facility Operating License No. NPF-62 and Appendix A to the Facility Operating License, the Technical Specifications (TS), for Clinton Power Station (CPS) to allow operation at uprated power levels. The proposed changes will allow CPS to operate at a power level of 3473 megawatts thermal (MWt). This represents an increase of approximately 20 percent rated core thermal power over the current 100 percent power level of 2894 MWt.

In Reference 2, the NRC requested environmental information to support their environmental assessment of these proposed changes. The attachment to this letter provides the requested information. The information provided in the attached report supercedes the previous environmental evaluation provided in Attachment D to Reference 1.

A001

Should you have any questions concerning this letter, please contact Mr. T. A. Byam at (630) 657-2804.

Respectfully,

Terrence W. Simpkin
for R. A. Ainger
Director - Licensing
Mid-West Regional Operating Group

Attachments

Affidavit
Attachment A: Clinton Power Station Environmental Report for Extended Power Uprate

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
AMERGEN ENERGY COMPANY, LLC	)	**Docket Number**
CLINTON POWER STATION, UNIT 1	)	**50-461**

SUBJECT: Additional Environmental Information Supporting the License Amendment Request to Permit Extended Power Uprate Operation at Clinton Power Station

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

T. W. Simpkin
Manager - Licensing
Mid-West Regional Operating Group

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 7th day of September, 2001.

" OFFICIAL SEAL "
Timothy A. Byam
Notary Public, State of Illinois
My Commission Expires 11/24/2001

Notary Public

Clinton Power Station Environmental Report For Extended Power Uprate

AmerGen

An Exelon/British Energy Company

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1.0 EXECUTIVE SUMMARY

This report presents an evaluation of the environmental impacts of the proposed Clinton Power Station (CPS) thermal power uprate from 2894 megawatts-thermal (MWt) to 3473 MWt. The intent of this report is to provide sufficient information for the NRC to evaluate the environmental impacts of power uprate in accordance with the requirements of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

The environmental impacts of Extended Power Uprate (EPU) are identified and compared against the environmental impacts which have been previously evaluated by the NRC in the Final Environmental Statement associated with the issuance of the CPS operating license and in other related docketed correspondences. The results of this comparison show that the conclusions of the Final Environmental Statement remain valid for plant operation at 3473 MWt.

The environmental impacts identified by the NRC in the Final Environmental Statement are based on conservative assumptions for source terms and other environmental parameters. Since initial operations, a variety of systematic environmental improvements have been implemented at CPS that have further increased the margin of conservatism associated with these assumptions. By adjusting current plant operating parameters for power uprate effects, it is readily demonstrated that the previous assumptions and conclusions concerning the environmental impact of CPS operation at present power levels continue to bound plant operation at power uprate conditions.

The CPS power uprate is being implemented without consequential changes to the plant systems that directly or indirectly interface with the environment. This evaluation demonstrates that the changes in environmental impacts of plant operation that will result from power uprate are insignificant. The environmental impacts of power uprate are either well bounded by previously evaluated environmental impacts and criteria established by the NRC in the Final Environmental Statement or well bounded by other applicable regulatory criteria. As a result, approval of the power uprate will not significantly affect the environment.

2.0 INTRODUCTION

AmerGen Energy Company, LLC (i.e., AmerGen) is committed to operating the Clinton Power Station (CPS) in an environmentally sound manner. Plant activities involving design, construction, maintenance, and operation are conducted in strict compliance with environmental regulations and careful consideration of environmental consequences. Numerous controls and modifications have been implemented to prevent and reduce impacts to the environment, and extensive environmental monitoring programs have been instituted at CPS. In keeping with this important obligation and in accordance with regulatory requirements, CPS has conducted a comprehensive environmental evaluation of the proposed extended power uprate from 2894 MWt to 3473 MWt.

This environmental evaluation is provided pursuant to 10 CFR 51.41, "Requirement to Submit Environmental Information," and is intended to fully support the NRC in complying with the requirements of Section 102(2) of the National Environmental Policy Act (NEPA), as amended, for the proposed change to the authorized operating power level at CPS. Environmental report general requirements are outlined in 10 CFR 51.45, "Environmental Report." The evaluation provides information necessary to determine the environmental impact of those particular changes associated with the proposed power uprate at CPS from 2894 MWt to 3473 MWt. This evaluation does not reassess the current environmental licensing basis or justify the environmental impacts of operating at the present power level.

The environmental impact of operation at the present power level has been reviewed and determined to be acceptable by the NRC. In 1982, an Environmental Report was submitted to the NRC as part of the application for an operating license for CPS (Reference 1). This report addressed the environmental impacts of construction and operation of the CPS. The report was utilized by the NRC in preparing a Final Environmental Statement (FES) in fulfillment of the requirements of NEPA (Reference 2). The NRC subsequently issued an operating license to CPS authorizing operation up to a maximum power level of 2894 MWt.

This evaluation demonstrates that the power uprate will not result in a significant increase in the environmental impacts of operation of the CPS. The environmental impacts of CPS operation with extended power uprate continue to be bounded by the FES or bounded by other appropriate regulatory criteria. This evaluation is submitted, in part, to fulfill the NRC requirement to submit a 'Supplement to the Applicant's Environmental Report' as documented in the Staff Position concerning GE BWR EPU Program date February 8, 1996 (Reference 22).

This environmental report will assess the impact of EPU on the environment, compare changes to those presented in the FES or in more recent environmental reports, identify reasonable alternatives to the proposed EPU, and recommend the proper course of action.

3.0 OVERVIEW OF OPERATIONAL AND EQUIPMENT CHANGES

CPS is a Boiling Water Reactor (BWR) that operates in a direct thermodynamic cycle between the reactor and the turbine. Under power uprate conditions, thermodynamic processes are changed to extract additional work from the turbine. Simply put, power uprate involves an increase in the heat output of the reactor to support increased turbine inlet steam flow requirements and an increase in the heat dissipated by the condenser to support increased turbine exhaust steam flow requirements. No changes in operating pressure or core flow are necessary to support power uprate. In the turbine portion of the heat cycle, increases in the turbine throttle pressure and steam flow will result in a small increase in the heat rejected to the Clinton Lake. The environmental impacts of these operational changes are discussed herein.

Due to design and safety margins inherent in plant equipment, the proposed power uprate can be accomplished with relatively few modifications. The most significant changes involve replacement of the high pressure and low pressure turbines, and replacement/modification of the main transformer. Other minor modifications to support power uprate are routine in nature and are being conducted within the plant boundary.

The modifications are being accomplished by standard maintenance and modification processes that are similar to those performed during normal outages. The majority of plant systems will not require any significant modifications.

4.0 PROPOSED ACTION AND NEED

4.1. Proposed Action

The proposed action is an amendment to the CPS Operating License to increase the licensed core thermal power level to 3473 MWt. The operational goal of this amendment is to increase electrical generating capacity. In conjunction with the plant designer, General Electric, the effects of a power uprate at CPS have been comprehensively evaluated. This evaluation concluded that sufficient safety and design margins exist such that an increase in the rated core thermal power from 2894 to 3473 MWt can be accomplished without adverse impact on the health and safety of the public and without significant impact on the environment.

Although the maximum authorized power level proposed by this action and evaluated for environmental impact herein is 3473 MWt, the intent is to raise power level in increments.

4.2. Need for Proposed Action

Once per year, the North American Electric Reliability Council performs a forecast reliability assessment using information provided by the regional reliability councils such as Mid-Continent Area Power Pool (MAPP) and Mid-America Interconnected Network (MAIN). The most current assessment includes a forecasted increase in expected customer peak demand, based on historical increases, of approximately 1.6% per year for the MAPP and MAIN regions through the 2000 - 2009 planning period. To meet this projected demand, generating capacity must be increased in the MAPP and MAIN areas by 2009 to maintain a 12% operating margin for reliability.

AmerGen has determined the need for additional generation resources in its territory through a comparison of the projected load growth to the generation and possible power purchases. There are two significant aspects of maintaining a flexible and robust supply portfolio. The first is to obtain low cost power. The second is to maintain a portfolio with sufficient diversity to allow the utilities to respond to changes in the underlying cost of power, owned or purchased. The increase in generating capacity of CPS provides AmerGen with lower cost power than can be obtained in the current and anticipated energy market. In addition, the increased generating capacity reduces exposure to potential cost increases in fossil fuel based alternatives.

Extended power uprate is an important step in improving the economic performance of CPS during and after utility deregulation. The improved performance is accomplished by cost reductions in production and total bus bar cost per kilowatt hour (kWh). Therefore, extended power uprate should enhance the value of CPS as a generating asset.

In the initial period of regulated operation, the uprate project would help AmerGen meet projected need for additional capacity. Comparing CPS to new Combustion Turbine Units, Combined Cycle, and Purchased Power agreements, increasing CPS generating capacity is the lowest cost option for maintaining a highly reliable power supply.

5.0 SOCIOECONOMIC EFFECTS

Extended power uprate does not affect the size of the CPS workforce and does not have a material effect upon the labor force required for future outages. The CPS contributions to local, state, and school taxes are of significant value to the local economy. The socioeconomic effects of implementing EPU at CPS are, in part, dependent on the ability of AmerGen to remain competitive in a market that is becoming deregulated. Implementation of EPU is not the primary factor affecting the overall competitiveness of AmerGen, but it is a factor that must be considered. AmerGen has determined that, notwithstanding the uncertainty associated with deregulation, the favorable capital cost of the proposed EPU compared to new generating capacity, and the reduction in incremental costs that result from EPU, make the EPU project attractive. In addition, the investment associated with the proposed EPU will result in increased revenues, thus enhancing the value of CPS as a provider of electricity and allow AmerGen to remain a strong partner within the community and the state of Illinois.

6.0 COST - BENEFIT ANALYSIS

The direct benefit of extended power uprate to AmerGen customers is that the program will supply approximately an additional 160 MW of reliable electrical generating capacity.

A quantitative study of environmental costs of alternatives is not necessary to recognize that significant environmental benefits can be derived from extended power uprate when compared to other options of adding capacity. As demonstrated herein, extended power uprate does not result in significant environmental costs. Unlike fossil fuel plants, CPS does not routinely emit Sulfur Dioxide ($S0_2$), Nitrogen Oxide (NO_x), Carbon Dioxide (CO_2), or other atmospheric pollutants during normal operation. Routine operation of CPS at extended power uprate conditions will not contribute to greenhouse gases or acid rain. The environmental effects of the fuel cycle are shown by 10 CFR 51.51, "Uranium fuel cycle environmental data – Table S-3," and 51.52, "Environmental effects of transportation of fuel and waste – Table S-4," to be very small, and the existing tables in part 51 (i.e., Tables S-3 and S-4) encompass the extended power uprate level (see Section 9.0). While the project will produce additional spent nuclear fuel, the added amount is not appreciable and can be accommodated by the facility.

Based upon the discussion above, it is reasonable to conclude the CPS extended power uprate project provides an economic advantage to other alternatives for added generation. Extended Power Uprate involves effective utilization of an existing asset with negligible environmental impact and is the preferable option to secure additional generation.

7.0 NON-RADIOLOGICAL ENVIRONMENTAL IMPACT

7.1. Terrestrial Effects

7.1.1. Land Use

The extended power uprate does not change the present CPS land use. There are no plans to build facilities or materially alter the land use to support extended power uprate activities. Except for transportation of equipment and routine disposal of waste, power uprate maintenance activities are confined to the inner-plant security fenced area. Extended power uprate does not affect the storage requirements for above ground or below ground tanks. Lands outside the inner security fence will not be affected by extended power uprate activities. Extended power uprate does not involve changes to any aesthetic resources and does not involve any impacts to lands with historical or archaeological significance.

The extended power uprate is not expected to require additional low-level radioactive waste storage facilities. The replaced turbine components will be decontaminated as necessary, and recycled to the extent possible, or transferred to an approved disposal facility.

7.1.2. Transmission Facilities

7.1.2.1. Transmission Design and Equipment

No changes in operating transmission or power line right of way are required to support extended power uprate. Higher main transformer

capacity will be necessary to deliver the additional power to the offsite grid.

7.1.2.2. Shock Hazards

Power uprate does not increase the probability of shock from primary or secondary currents. Transmission lines are designed in accordance with the applicable shock prevention provisions of the National Electric Safety Code.

7.1.2.3. Electromagnetic Fields (EMF)

There is no scientific consensus regarding the health effects, if any, of exposure to electromagnetic fields. Chronic effects of EMF on humans are not quantified at this time, and no significant impacts to terrestrial biota have been identified. Notwithstanding the above, the following information is presented to show that power uprate does not involve significant increases in exposure to electromagnetic fields from transmission lines.

The increased generator output at CPS will cause a corresponding current, and thus magnetic field, rise in the onsite transmission line between the CPS main generator and the plant substation. This is located within the outer fenced boundary of the plant where public access is prohibited.

7.1.3. Miscellaneous Wastes

Sanitary wastes from CPS are discharged directly to the CPS Sewage Treatment Plant in accordance with a permit issued by the State of Illinois. Other waste sources at CPS include hazardous waste generation from routine plant operations and air emissions from the plant heating boiler and diesel generators. Effluents from these pathways are controlled as required. Power uprate does not have any significant impact on the quality or quantity of effluents from these sources, and operation under power uprate conditions will not reduce the margin to the limits established by the applicable permits.

7.1.4. Cooling Lake Fog and Icing

Estimates of ground fog frequency and icing, and their associated environmental impacts during operation at the current power level, were provided in the CPS Environmental Report (Reference 1). Based on the large conservatisms included in the original analysis and plant operating experience, the impact of ground fog and icing generated by plant operation at the uprated power level is bounded by the conclusions in the CPS Environmental Report.

Icing, and fog from the CPS discharge canal, has no discernible impacts on vegetation, agriculture, recreational activities, or highway safety.

7.1.5. Noise

The extended power uprate will not result in significant changes to the character, sources, or energy of noise generated at CPS. The new equipment necessary to implement power uprate will be installed within existing plant buildings. No

significant increase in ambient noise levels is expected within the plant. This includes the upgraded turbines, which will operate at the same speed as the original equipment. The Environmental Report conclusions for noise levels remain bounding for extended power uprate conditions.

7.1.6. Terrestrial Biota

Extended power uprate will not change the previously evaluated land use at CPS and will not disturb the habitat of any terrestrial plant or animal species as previously evaluated. There are no significant increases in previously evaluated environmental impacts from operation at extended power uprate conditions.

7.2. Hydrology

7.2.1. Groundwater

Extended power uprate does not affect groundwater resources nor does it involve a change in the use of these resources at CPS.

7.2.2. Surface Water Use

Clinton Power Station uses the impounded volume of Clinton Lake for all of its water requirements. Power uprate will result in negligible change in the consumptive use of water from the lake, and the conclusions of the FES remain valid. No increase in cooling water flow is expected from power uprate.

7.2.3. Discharges

Surface water and wastewater discharges are regulated by the State of Illinois. The National Pollutant Discharge Elimination System (NPDES) permit (Reference 7) is periodically reviewed and re-issued by the Illinois Environmental Protection Agency (IEPA). The present NPDES permit for CPS authorizes discharges from eighteen outfalls, only one of which is impacted by extended power uprate. That impact is discussed in 7.2.4 below.

7.2.4. Increase in Circulating Water Discharge Temperature

Effluent from the circulating water system is discharged from the cold water side of the system and is directed back to the Clinton Lake via the discharge flume. The IEPA evaluated impacts to the lake environment from plant operation and established limits for this effluent consistent with protection of the resource. The NPDES permit issued by the IEPA limits discharge temperatures at the end of the discharge canal to a maximum daily average of 99F for 90 days in a calendar year and a maximum limit of 110.7F on any given day. CPS has consistently operated in conformance with the permit's thermal discharge requirements. At extended power uprate conditions, the heat rejected by the condenser increases, resulting in a corresponding increase in the circulating water discharge temperature. However, the plant will continue to be operated in compliance with the established limitations of the NPDES permit. Consequently, the conclusions in the FES regarding thermal impact to the lake are still valid.

7.2.5. Clinton Lake Water Quality

Based on over 10 years of water quality monitoring, CPS operation has not adversely affected the water quality of the Clinton Lake. There is no indication that discharges from CPS have caused any detrimental effects to the aquatic biota.

Water quality monitoring programs have been established in accordance with the NPDES permit effluent limitations and monitoring. Modifications of the non-radiological drain systems are not required due to power uprate, and biocide/chemical discharges will be consistent with existing permit limits. Power uprate will not introduce any new contaminants or pollutants and will not significantly increase the amount of any potential contaminants presently allowed for release by the IEPA.

7.2.6. Cold Shock

The risk of fish being killed by cold shock will continue to be bounded by the FES. Cold shock results when the warm water discharge from a plant abruptly stops due to an unplanned shutdown. The probability of an unplanned shutdown is independent of power uprate. Although power uprate will increase the discharge flume temperature, it will continue to be operated within the current NPDES temperature limitations. Consequently, the increase in risk of fish mortality due to cold shock will not be significant, and the total risk will continue to be bounded by the FES.

7.2.7. Impingement and Entrainment

Impingement and entrainment are evaluated in the FES for one unit full power operation as having minimal impact to the aquatic community of Clinton Lake. Extended power uprate does not increase the flow requirements of the plant and, therefore, the original evaluation remains valid.

8.0 RADIOLOGICAL ENVIRONMENTAL IMPACT

8.1. Radioactive Waste Streams

The radioactive waste systems at CPS are designed to collect, process, and dispose of radioactive wastes in a controlled and safe manner. The design bases for these systems during normal operation limit discharges in accordance with 10 CFR 20, "Standards for Protection Against Radiation," and satisfy the design objectives of Appendix I to 10 CFR 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." These limits and objectives will continue to be adhered to under extended power uprate.

In addition, operation at extended power uprate conditions does not result in any changes in the operation or design of equipment in the solid waste, liquid waste, or gaseous waste systems. The safety and reliability of these systems is unaffected by power uprate. Neither the environmental monitoring of any of these waste streams, nor the radiological monitoring requirements of the CPS Technical Specifications and/or Offsite Dose Calculation Manual will be affected by extended power uprate.

Furthermore, extended power uprate does not introduce any new or different radiological release pathways nor does it increase the probability of an operator error or equipment malfunction that would result in an uncontrolled radioactive release. The specific effects of power uprate on each of the radioactive waste systems are evaluated below.

8.1.1. Solid Waste

The annual environmental impact of low- and high-level solid wastes has been generically evaluated by the NRC Staff for a 1000 MWe reference reactor. The estimated activity content of these wastes is given by Table S-3 in 10 CFR 51.51 and is bounding for CPS at extended power uprate operating conditions.

Given the following information, the environmental impact due to generation of solid radwaste from power uprate conditions is insignificant.

CPS continually tracks the volume of solid radwaste generated. In addition, CPS has a volume reduction program with a purpose to continually identify and implement volume reduction techniques. For calendar year 2000, the low-level solid radwaste volume at CPS was 111.7 cubic meters. For calendar year 2001, the projected low-level solid radwaste volume is 115 cubic meters.

The largest volume contribution to radioactive solid wastes is due to spent resins from process wastes. Equipment wastes from operational and maintenance activities, chemical wastes, and reactor system wastes also contribute to solid waste generation. Extended power uprate does not significantly affect the amount or type of equipment and chemical wastes. The effect of extended power uprate on process wastes and reactor system wastes is evaluated below.

8.1.1.1. Process Wastes

Power uprate conditions are expected to result in an increase in the process wastes generated from operation of the Reactor Water Cleanup (RWCU) filter/demineralizers and the condensate demineralizers approximately proportional to the power uprate.

The change-out limits for the RWCU and Condensate Demineralizer systems filter/demineralizers are based on differential pressure and effluent chemistry. It is expected that more frequent backwashes will occur at extended power uprate conditions due to an increase in the flow rate through both systems. The purity of the influent and filter performance is not expected to change. CPS estimates the increase in backwashes to be less than 20% of the current value.

The small increases in solid wastes from the processes described above will not result in waste volumes substantially above present levels. Moreover, in light of CPS's ongoing efforts to reduce radioactive wastes, the projected increase in solid waste generation from process wastes under extended power uprate conditions described above is not significant.

8.1.1.2. Reactor System Wastes

CPS loaded 188 fresh fuel bundles in the most recent refueling outage to prepare for operation under extended power uprate. Because of the mitigating effects of extended burnup and increased U-235 enrichment on fuel throughput under power uprate operating conditions, the number of irradiated fuel assemblies discharged from the reactor is expected to be approximately the same during subsequent reloads. These wastes are currently stored in the spent fuel pool and are not shipped offsite.

The volume and activity of waste generated from spent control blades and in-core ion chambers may increase slightly under the higher flux conditions associated with power uprate conditions. This is not expected to be significant and will be accommodated within the normal onsite storage facility.

8.1.2. Liquid Radwaste

Although AmerGen is authorized to discharge liquid radwaste, it has administratively operated CPS as a zero radioactive liquid release plant since 1992. No change is expected in the zero release policy as a result of extended power uprate.

Filter backwashing provides input to the liquid radwaste system from dewatering of sludge. Increasing reactor thermal power will increase decanted inputs due to the expected 20% increase in Reactor Water Cleanup condensate demineralizer backwash frequency (See Section 8.1.1.1 above). AmerGen will continue with its policy of not releasing radioactive liquids to the environment, so this small increase in input to the liquid radwaste system will be recycled instead of discharged, and therefore will not affect the environment.

Extended power uprate conditions will not result in significant increases in the volume of fluid from other sources to the Liquid Radwaste System. The reactor will continue to be operated within its present pressure control band. Valve packing leakage volume into the Liquid Radwaste System is not expected to increase. There will be no changes in reactor recirculation pump seal flow or any other normal equipment drain path. In addition, there will be no impact to the Equipment Drain, Floor Drain, or Chemical Waste subsystems of the Liquid Radwaste System as a result of extended power uprate since the operating modes and the inputs to these subsystems are independent of extended power uprate.

8.1.3. Gaseous Wastes

CPS radioactive gaseous effluents are released through the common station heating, ventilation, and air conditioning (HVAC) stack and the Standby Gas Treatment System (SGTS) vent. Following a design basis LOCA, the SGTS achieves and maintains a negative pressure in the areas that comprise the secondary containment. Any primary containment leakage will be contained within the secondary containment and will only be released to the outside after passing through the SGTS. All releases from the SGTS are through the 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. The dose to individuals from normal gaseous effluent releases at CPS are well within the guidelines of 10 CFR 50 Appendix I and the limits of 10 CFR 20 for all airborne radioactive nuclides.

The common station HVAC stack receives gaseous effluent from the Main Condenser Offgas System. The effect of power uprate on the gaseous wastes processed by the common station HVAC stack is not significant.

The radioactivity in this pathway is continually monitored to assure doses to members of the public are maintained within federal limits. The alarm setpoint for the stack monitoring system is set at a level required to maintain the 10CFR20 limits as specified by CPS Technical Specifications. The setpoint is currently 3.8E-04 μCi/sec. Continuous releases at this level would result in offsite doses below 10 CFR 20 limits.

The FES estimates a 6600 curies (Ci)/yr noble gas and a 0.46 Ci/yr Iodine-131 release rate for CPS. The actual release quantity for the year 2000 at CPS was 5.44E-03 Ci noble gases and 1.73E-04 Ci Iodine-131. Assuming that extended power uprate will result in an increase in the release rate that is linearly proportional to power, the resultant effluent increases in noble gas and I-131 activity are 1.37E-04 and 1.1E-06 μCi/sec respectively over those values currently measured during plant operation. The stack gaseous effluents for noble gases and halogens, at extended power uprate conditions, are well below that previously evaluated by the FES.

Particulate and tritium release rates were evaluated in the FES at values of 1.75Ci/yr and 57 Ci/yr respectively. Actual release quantities for particulate and tritium for calendar year 2000 were 3.32E-03 Ci and 41.64 Ci respectively and have been an insignificant contributor to dose. Assuming that the particulate and tritium release rates are approximately proportional to the power increase, their contribution to dose will remain insignificant.

During normal plant operation, the containment building ventilation system and the continuous containment purge system is used to vent and purge the containment. The containment building air is vented or purged to the common station HVAC stack. During startup, the mechanical vacuum pump also discharges to the common station HVAC stack. From plant operating experience, there is no significant increase in gaseous effluent levels during primary containment venting or mechanical vacuum pump operation when compared to nominal stack releases. Consequently, operation of the offgas stack in these modes under extended power uprate conditions will not result in a significant increase in gaseous effluent release levels.

For these reasons, the effect of extended power uprate on radioactive gaseous effluents from the common station HVAC stack pathway is negligible, and compliance with the release limits of 10 CFR 20 and the guidelines of Appendix I to 10 CFR 50 is maintained with significant margin.

8.2. Radiation Levels and Offsite Dose

8.2.1. Operating And Shutdown In-Plant Radiation

Over the last 10 years, the occupational dose to CPS workers has decreased significantly. The CPS dose for 2001, based on a rolling three year average, is projected to be only 32% of the dose starting in 1990. Although extended power uprate will involve potential increases in radiation levels, these potential increases are more than compensated for by program improvements and administrative controls, and the continuing downward trend in occupational exposures at CPS is expected to continue.

CPS was conservatively designed with respect to shielding and radiation sources. In the shielding analysis, assumed concentrations for reactor water fission and corrosion products were 2.5 μCi/g and 0.062 μCi/g respectively. The normal value of both reactor water fission and corrosion products combined is approximately 0.016 μCi/g. With expected increases in operating activity approximately proportional to the proposed power increase, the design shielding assumptions remain bounding with significant margin at extended power uprate conditions.

The plant radiation protection program will be used to maintain individual doses consistent with ALARA policies and well below the established limits of 10 CFR 20. Routine plant radiation surveys required by the radiation protection program will identify increased radiation levels in accessible areas of the plant and radiation zone postings and job planning will be adjusted if necessary. Time within radiation areas is controlled under the radiation protection program. Administrative dose control limits are established well below regulatory criteria and provide significant margin to that allowed by regulatory dose limits. Administrative dose limits are not routinely exceeded under present power conditions.

8.2.2. Offsite Doses at Power Uprate Conditions

The small increase in normal operational gaseous activity levels under extended power uprate does not affect the large margin to the offsite dose limits established by 10 CFR 20. In addition, doses from liquid effluents are currently zero and are expected to remain zero under extended power uprate conditions.

The CPS Technical Specifications implement the guidelines of 10 CFR 50 Appendix I, which are well within the 10 CFR 20 limits. Adjusting present values for projected extended power uprate increases, the estimated offsite doses at extended power uprate conditions are presented in Table 8-1 below. The offsite doses are not changed significantly and continue to be well within the conservative Technical Specification dose limits.

Table 8-1

Radiological Effluent Doses

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

Extended power uprate does not involve significant increases in offsite doses from noble gases, airborne particulates, iodine, or tritium. Radioactive liquid effluents are not routinely discharged from CPS. In addition, radiation from shine is not presently a significant exposure pathway, and is not significantly affected by extended power uprate.

Extended power uprate does not create any new or different sources of offsite dose from CPS operation, and extended power uprate does not involve significant increases in present radiation levels. Therefore, under extended power uprate conditions, offsite dose will remain well within regulatory criteria.

8.3. Radiological Consequences Of Accidents

Section 5 of the CPS Final Environmental Statement identifies three classes of postulated accidents at CPS that were evaluated to determine the associated environmental impact. Accidents in this context include those events evaluated for environmental consequences by the Environmental Report in addition to design basis accidents contained in the CPS Safety Evaluation Report (Reference 16).

The following discussion addresses the impact of extended power uprate on the assumptions and conclusions for the environmental accident classes previously evaluated in the CPS FES.

8.3.1. Class 1 – Incidents of Moderate Frequency

Incidents in this category are also called anticipated operational occurrences. The FES considered that an incident of this type would cause releases that are commensurate with routine effluents. Because of plant improvements, the activity concentrations of reactor coolant are considerably less than that predicted by the FES. The above conclusion remains valid for extended power uprate.

8.3.2. Class 2 - Infrequent Accidents

Class 2 events are those events that might occur once during the life of the plant. Extended power uprate does not increase the probability of occurrence or severity of these events. Events evaluated in the FES are further discussed in the following sections.

8.3.2.1. Off-Gas System Failure

Section 7.1.3.2 of the Environmental Report describes the assumptions used in analyzing this event. The release is the result of a loss of a drain line water seal, and the inventory is based on a thirty minute old diffusion mix equivalent to 25,000 μCi/sec.

Current operating levels are significantly below the design basis levels. While these levels will increase under extended power uprate, the radiological exposures for this event are negligible when compared to those exposures from natural background and other man-made radiation sources. Consequently, the dose conclusions of Table 5.7 of the FES for this event remain bounding for extended power uprate.

8.3.2.2. Release of Radwaste Storage Tank Contents

Section 7.1.3.1 of the Environmental Report describes the assumptions used in analyzing this event. The release is the result of an inadvertent pumping of a radwaste tank to the discharge canal. The liquid, having a concentration of 1.4 E-06 μCi/cc is pumped at the normal pumping rate for 20 minutes. The event is initiated by one of the following three single operator errors.

- The operator commences pumping without taking a batch sample.
- A batch sample is incorrectly analyzed or the results are incorrectly communicated, prior to discharge.
- The operator pumps the wrong tank.

This accident was postulated because liquid radwaste discharges were expected to be routine. However, changes to the liquid radwaste system and changes in CPS's liquid radwaste discharge policies make this event extremely unlikely for both current power and extended power uprate operating conditions. Liquid radwaste discharge is not routinely performed at CPS. Since 1992, CPS has been administratively operated as a zero radioactive liquid discharge plant, and liquid radwaste is not discharged to the canal. There are manual valves in the liquid radwaste discharge line, which are maintained closed and locked. In addition, a keyed switch in the radwaste control room operates an additional valve. The key to this valve is not controlled by the individual who would discharge the tank, but rather by personnel in a different department. Consequently, inadvertent pumping of liquid radwaste would require a sequence of events involving multiple unlikely personnel errors, and is considered to be implausible.

8.3.2.3. Small Break Loss of Cooling Accident (LOCA)

The small break LOCA is evaluated by the FES to cause a two hour dose at the site Exclusion Area Boundary (EAB) to an individual of less than 0.00005 rem. Using the calculation performed for the Large Break LOCA for the increase in the core inventory of noble gases and halogens, the projected two hour dose at the EAB, to an individual, would increase to less than 0.000065 rem. This increase is not significant and well within regulatory limits. All other analyses of this event are bounded by the Large Break LOCA analysis.

8.3.2.4. Fuel Handling Accident

This accident assumes an equipment failure that allows a channeled fuel bundle to drop, from the maximum permissible height, onto unchanneled spent fuel assemblies in the spent fuel pool outside of primary containment. This event was chosen because the consequences are more severe than a similar event occurring inside the primary containment boundary.

For the fuel handling accident, the USAR calculates the design basis whole body dose at the Exclusion Area Boundary for this event to be 0.24 rem. This estimate needs to be increased by approximately 30% because of the increase in fuel assembly inventory associated with extended power uprate. Adjusting for the increased fuel inventory, the dose is estimated to be 0.312 rem. This dose is a small fraction of the allowable 10CFR100, "Reactor Site Criteria," limits. Thus, the conclusion that this event is not significant with regard to environmental effects remains valid.

The FES estimated the realistic dose to the whole body during a 2 hour exposure at the Exclusion Area Boundary during this event to be 0.01 Rem. Adjusting these estimates for extended power uprate will not alter the conclusion that the environmental risks due to this postulated radiological accident at CPS remain exceedingly small under extended power uprate conditions.

8.3.3. Limiting Faults

The environmental impact analysis made in the FES for Limiting Fault (Category 3) accidents was based on information provided in the Environmental Report. These accidents included the Large Break LOCA, the Main Steam Line Break, and the Control Rod Drop Accident.

The postulated design basis accidents were modeled and analyzed to determine numerical dose outcomes under power uprate conditions for direct comparison with regulatory limits. The radiological consequences of these design basis accidents represent the worst case environmental consequences. The regulatory limits for these accidents are delineated by 10CFR100 for offsite doses. The results of these analyses demonstrate that extended power uprate has an insignificant environmental impact. The accident doses for postulated environmental accidents under extended power uprate conditions remain well within regulatory guidelines.

These accidents were conservatively analyzed at initial licensing by assuming an initial power level of 3039 MWt for the LOCA and 2952 MWt for the CRDA. These postulated power levels are 105% and 102% respectively of a bounding analytical power level of 2894 MWt. The results of these studies are presented in the following tables with the results of the EPU evaluations for comparison. The Main Steam Line Break off-site doses were analyzed and are not affected by EPU due to no change in reactor dome pressure, limited steam flow and design basis coolant activity.

Table 8-2

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

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 tables demonstrate that offsite dose levels under extended power uprate conditions are well within regulatory guidelines. The assumptions used in this analysis are conservative with respect to extended power uprate operating conditions, shielding, and dose.

Given the above, the radiological consequences of a design basis accident under extended power uprate conditions are within the acceptance criteria of 10CFR100 and do not involve any significant impact to the human environment.

8.4. Other Potential Environmental Accidents

Extended power uprate does not significantly change the inventory, storage, usage, or control requirements for chemicals, industrial gases, oil, oil products, or other hazardous substances. Extended power uprate will not require the introduction or use of any new hazardous substances. Extended power uprate will not result in a significant increase in the probability or consequences of an oil spill, chemical spill, industrial gas release, or other event involving a non-radioactive hazardous substance.

9.0 ENVIRONMENTAL EFFECTS OF URANIUM FUEL CYCLE ACTIVITIES AND FUEL AND RADIOACTIVE WASTE TRANSPORTATION

The data presented in Tables 5.12 (10CFR51.51 Table S-3) and 5.5 (10CFR51.52 Table S-4) of the FES (Reference 2) are, in part, based on an average burnup assumption of 33,000 MWd/MtU and a U-235 enrichment assumption of 4 wt.%. Under extended power uprate 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 still be less than 4 wt.%. The NRC has previously evaluated the impact of increased burnup to 75,000 MWd/MtU (62,000MWd/MtU for gap-release fraction) with U-235 fuel enrichment to 5 wt.% on the conclusions of Table S-3 (Reference 15). 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 determined that the incremental environmental effects of increased enrichment and burnup on transportation of fuel, spent fuel, and waste were not significant. In addition, the NRC recognized the salient 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 were bounding and were also applicable for burnup levels to 75,000 MWd/MtU (62,000 MWd/MtU for those parameters affected by gap-release fraction) and U-235 enrichment levels up to 5 wt.%.

10.0 DECOMMISSIONING EFFECTS

The environmental effects of decommissioning were evaluated in the FES and it was determined that the primary contributor to environmental impact was the dose from transportation of waste to disposal facilities. As concluded in Section 9.0 above, the impact of EPU on transportation of fuel and radioactive waste is not significant. Extended power uprate does not affect the ability to maintain sufficient financial reserves for decommissioning.

11.0 CONCLUSIONS

Extended power uprate does not result in significant impacts to the environment. It does not result in significant new environmental hazards in addition to those previously evaluated. The environmental impacts and adverse effects identified in the Summary and Conclusions Section of the FES for CPS operation at 2894 MWt continue to bound plant operation at extended power uprate conditions. The proposed changes do not, individually or cumulatively, affect the human environment. There is no significant change in the types or amounts of plant effluents. Extended power uprate does not involve significant increases in individual or cumulative occupational radiation exposure.

The effect of power uprate on the environment does not prevent continued compliance with any environmental permit. None of the license conditions for environmental protection will be changed for extended power uprate. No effluent limits will be exceeded, and the present large margins to these limits will not be significantly changed. Extended power uprate does not involve an increase in the discharge of hazardous substances, contaminants, or pollutants and does not involve the use of any new hazardous substances, contaminants, or pollutants.

Extended power uprate does not involve any changes to air quality or water quality. It does not result in any changes to land use and has an insignificant effect on groundwater and surface water use. The amount of water withdrawn and consumed from the Clinton Lake remains within that previously evaluated. The increase in discharge canal temperature has an insignificant effect on lake temperature and will not result in any significant changes to aquatic biota. Extended power uprate will not involve new or different discharges of contaminants and does not involve changes to any bio-accumulation effects for aquatic organisms. The quality of drinking water is not affected.

Extended power uprate does not involve any changes to wildlife habitat and does not result in any significant impacts to aquatic or terrestrial biota. There are no deleterious effects on the diversity of biological systems or the sustainability of species due to extended power uprate. Extended power uprate does not involve additional changes to the stability or integrity of ecosystems. Extended power uprate does not affect the previous conclusions on impingement or entrainment. Extended power uprate does not

affect CPS compliance with Sections 316(a) or 316(b) of the Federal Water Pollution Control Act.

Extended power uprate does not significantly change any doses to the public from radiological effluents, and offsite doses will continue to be well within regulatory limits. The Safety Evaluation for CPS concluded that the release of radioactive material in liquid and gaseous effluents from CPS will meet the requirements of 10CFR50 for keeping such effluent levels to unrestricted areas as low as reasonably achievable and will result in doses that are a small percentage of the 10CFR20 limits. This conclusion was based on assumptions for effluent releases that bound releases expected for extended power uprate. Occupational dose will be maintained well within regulatory limits, and changes in radiation levels will not significantly increase the dose to the CPS work force. Accident doses under extended power uprate conditions remain well within the applicable regulatory limits. Extended power uprate does not involve significant increases in the probability or consequences of previously evaluated environmental accidents.

This environmental evaluation has demonstrated that extended power uprate does not involve environmental impacts that differ significantly from those previously evaluated for the present authorized power level. Where environmental impacts differ from those previously evaluated, these impacts have been shown to be insignificant and well within regulatory environmental acceptance criteria.

12.0 REFERENCES

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9. "CPS 2000 Annual Radiological Environmental Operating Report," AmerGen, Clinton Power Station.

10. "CPS 2000 Annual Radioactive Effluent Release Report," AmerGen, Clinton Power Station.

11. CPS Updated Safety Analysis Report, Chapter 12, "Radiation Protection"

12. CPS Updated Safety Analysis Report, Chapter 15, "Accident Analyses"

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22. Staff Position concerning the GE BWR EPU Program (TAC No. M91680), February 8, 1996.

23. Task T0605 Final Task Report: Main Condenser/Circulating Water/Normal Heat Sink Performance and Discharge Limits

24. Task T0800 Final Task Report: Liquid and Solid Radwaste Management

25. Task T0801 Final Task Report: Gaseous Waste Management

26. Task T0802 Final Task Report: Radiation Sources

27. Task T0803 Final Task Report: Radiation Levels

28. Task T0804 Final Task Report: Normal Operation Off-Site Doses

29. Task T0901 Final Task Report: Accident Radiological Analyses