NUCLEAR REGULATORY COMMISSION

[Docket No. 50–331]

Nuclear Management Company, LLC; Duane Arnold Energy Center Environmental Assessment and Finding of No Significant Impact Related to a Proposed License Amendment To Increase the Maximum Rated Thermal Power Level

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an amendment to Facility Operating License No. DPR–49, issued to Nuclear Management Company, LLC (NMC), for operation of the Duane Arnold Energy Center, located in Linn County, Iowa. Therefore, pursuant to 10 CFR 51.21 and 10 CFR 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 NMC, the operator of DAEC, to incrementally increase its electrical generating capacity by raising the maximum reactor core power level from 1658 MWt to 1912 MWt, 15.3 percent above the current maximum licensed power level. The change is considered an EPU for a BWR because it would raise the reactor core power level more than approximately 7 percent above the original maximum licensed power level. A previous 4.1-percent power uprate, implemented in 1985, raised the original maximum power level from 1593 MWt to 1658 MWt. A power uprate increases the heat output of the reactor to support increased turbine inlet steam flow requirements and increases the heat dissipated by the condenser to support increased turbine exhaust steam flow requirements.

The proposed action is in accordance with NMC's application for amendment dated November 16, 2000, as supplemented April 16 (two letters) and 17; May 8 (two letters), 10, 11 (two letters), 22, and 29; June 5, 11, 18, 21, and 28; July 11, 19, and 25; and August 1, 10, 16, and 21; and October 17, 2001, and NMC's ''Supplement to DAEC Environmental Report,'' submitted on September 22, 2000, in advance of the application.

The NRC previously published a draft environmental assessment of the proposed action in the **Federal Register** (66 FR 48482, September 20, 2001) and offered an opportunity for public comment. No comments were received.

Need for the Proposed Action

Alliant Energy—IES Utilities (Alliant), the principal owner of DAEC,[1] has compared the projected load growth to its electrical generating capacity and has determined a need for additional capacity in its territory. Alliant's obligated capacity is expected to increase by 2 percent per year. The proposed EPU would add 80 megawatts of electrical generating capacity to the grid. The estimated cost of adding this generating capacity is approximately half the cost of purchasing power and one-third the cost of providing the power by constructing a new combined-cycle, natural-gas-fueled facility. Therefore, Alliant concluded that increasing DAEC's capacity would be the most economical option for increasing power supply. Furthermore, unlike fossil fuel plants, DAEC does not routinely emit sulfur dioxide, nitrogen oxide, carbon dioxide, or other atmospheric pollutants.

Environmental Impacts of the Proposed Action

At the time of the issuance of the operating license for DAEC, 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 DAEC, which was issued in March 1973. The original operating license for DAEC allowed a maximum reactor power level of 1593 MWt. On September 22, 2000, NMC submitted a supplement to its Environmental Report supporting the proposed EPU action and provided a summary of its conclusions concerning the environmental impacts of the proposed action. Based on the NRC staff's independent analyses of the nonradiological and radiological impacts and the evaluation performed by the licensee, the staff has concluded that the environmental impacts of the EPU are bounded by the environmental impacts previously evaluated in the FES because the EPU does not involve extensive changes to plant systems that directly or indirectly interface with the environment. Additionally, the licensee states that no changes to the National Pollutant Discharge Elimination System permit issued by the State would be necessary.

[1] On January 10, 2001, the NRC published in the **Federal Register** (66 FR 2009) an Environmental Assessment and Finding of No Significant Impact regarding a requested change to the DAEC operating license to reflect the proposed change in the owner's name from IES Utilities, Inc., to Interstate Power and Light Company. The NRC's final action regarding the requested name change is pending.

Nonradiological Impacts

The following is the NRC staff's evaluation of the nonradiological environmental impacts of the EPU on land use, water use, waste discharges, terrestrial and aquatic biota, transmission facilities, and social and economic conditions at DAEC.

Land Use Impacts

The proposed EPU would not modify the land use at the site, nor have any impacts on lands with historic or archaeological significance. The licensee states that it has no plans to construct any new facilities or alter the land around existing facilities, including buildings, access roads, parking facilities, laydown areas, onsite transmission and distribution equipment, or power line rights-of-way, in conjunction with the EPU. The EPU would not significantly affect the storage of materials, including chemicals, fuels, and other materials stored above or under the ground. The EPU would not alter the aesthetics of the site. Therefore, the FES conclusions for impacts on land use would remain valid under EPU conditions.

Water Use Impacts

The staff evaluated surface water use and groundwater use as environmental impacts of water usage at DAEC.

Surface Water Use

An EPU is accomplished by increasing the heat output of the reactor, thereby increasing the steam flow to the turbine, for which increased feedwater flow is needed. The increased heat load on the cooling tower would cause evaporative losses to increase; therefore, cooling tower makeup to the circulating water system increases to compensate for the increase in evaporative losses. Cooling tower makeup at DAEC is supplied by the Cedar River and well water systems. The EPU would not change the amount of water withdrawn from the well water system. The EPU would require an increase in river water use; however, the licensee stated that DAEC would not use more river water than permitted. In accordance with the water appropriation limits of the Iowa Department of Natural Resources (IDNR), DAEC may withdraw a maximum of 12,575 million gallons per year (MGY) from the Cedar River at a rate of 27,000 gallons per minute (gpm) minus the total well water withdrawal rate (3000 gpm). Special operating restrictions apply at lower-than-average river flows if the withdrawal would reduce the river flow to less than 500 cubic feet per second (cfs). A maximum flow rate of 11,000 gpm and an annual

withdrawal rate of 5782 MGY were analyzed in the FES. During the years 1996 through 1999, the flow at DAEC averaged 5680 gpm. The licensee predicts the flow will be 6700 gpm under EPU conditions. The predicted flow average under EPU conditions is approximately 40 percent less than that analyzed in the FES and is below the IDNR-permitted limits. In the period 1996–1999, the annual withdrawal rate at DAEC averaged 3000 MGY; the licensee projects it will be 3540 MGY under EPU conditions. The 3540 MGY projected average flow withdrawal rate is also below the value evaluated in the FES and the IDNR-permitted limit of 12,575 MGY. The EPU would have no impact on the number of cooling tower concentration cycles or on the cooling tower flow rate. Therefore, current water appropriation limits would be maintained and the conclusions in the FES would remain valid under the proposed EPU conditions.

Groundwater Use

The staff evaluated the consumption of groundwater as an environmental impact of the proposed EPU. Groundwater use at DAEC is governed by a permit issued by the IDNR. The permit limits DAEC to 1575 MGY with the flow from all pumps not to exceed 3000 gpm. A maximum flow rate of 1500 gpm and a withdrawal rate of 788 MGY were evaluated in the FES. The average annual groundwater withdrawal rate for DAEC is 762 MGY, with a normal system flow averaging 1420 gpm.

The licensee stated that the proposed EPU would not increase the consumption of groundwater, would not impact the well water system flow path, and does not require any additional cooling capacity from the groundwater in order to shed heat loads. Therefore, the staff's conclusions in the FES on groundwater use are valid for the proposed EPU.

Discharge Impacts

The staff evaluated environmental impacts such as cooling tower fogging, icing, drift, noise, chemical discharges to surface water, sanitary waste discharges, blowdown, thermal plume spread, temperature of the river water, cold shock to aquatic biota, hazardous waste effluents, and air emissions.

Cooling Tower Fogging, Icing, Drift, and Noise

Environmental impacts such as fogging, icing, cooling tower drift, and noise could result from the increased heat load on the cooling tower under EPU conditions. In the FES, the staff concluded that the operation of the DAEC cooling towers may slightly increase fogging and icing in nearby areas. The staff stated that cooling tower drift was estimated to be a maximum of 0.1 percent of cooling water flow, or 0.65 cubic feet per second (290 gpm). The estimates were based on anticipated evaporation and drift rates of 2.25 percent and 0.5 percent of tower flow, respectively. The licensee stated that the total hours of fogging would increase by approximately 1.1 hour per year above the nominal 240 hours per year, and that icing would be insignificant. The proposed EPU would not change the cooling tower flow or drift rate; however, the evaporation rate was calculated to increase to approximately 3 percent.

Since the original analysis in the FES, the cooling towers at DAEC have been upgraded by replacing the wooden drift eliminators with polyvinyl chloride (PVC) drift eliminators. The PVC drift eliminators allow water droplets to return to the cooling tower air stream and channel water to the cooling tower's cold water basin, which reduces evaporation and drift losses. Consequently, the licensee's analysis of the effect of the EPU on fogging is conservative.

After considering the increase in heat load on the cooling towers, the staff concluded that the incremental effects of fog attributable to the proposed EPU would be negligible and would continue to be bounded by the FES. Other cooling tower impacts, such as drift and icing, would not be expected to change as a result of the EPU. Therefore, the staff finds that the conclusions in the FES for fogging, icing, and cooling tower drift would be valid under the proposed EPU conditions.

The FES also stated that the operation of the cooling towers would result in a noticeable, but acceptable, increase in the noise level at the nearest dwelling. The proposed EPU would not significantly change the character, sources, or energy of noise generated at DAEC. The new equipment necessary to implement the EPU would be installed within existing plant buildings and no significant increase in ambient noise levels within the plant would be expected. Therefore, the FES conclusions for noise levels would remain valid under EPU conditions.

Chemical and Sanitary Discharges

Surface water and wastewater discharges are regulated by the State of Iowa. The National Pollutant Discharge Elimination System (NPDES) permit is periodically reviewed and reissued by the IDNR. The present NPDES permit for DAEC authorizes discharges from two outfalls, only one of which would be affected by the EPU.

The use of chemicals and their subsequent discharge to the environment would not be expected to change significantly as a result of the proposed EPU. The cooling tower concentration cycle would remain within the current range of 3.5 to 4.0. Therefore, the concentration of pollutants in the effluent stream would remain the same. No changes to the sanitary waste systems or to the parameters regulated by the NPDES permit would be needed to accomplish the EPU. Sanitary waste from DAEC is discharged directly to the DAEC sewage treatment plant in accordance with a permit from the State of Iowa.

Blowdown

Total discharge would increase linearly with blowdown flow. It is anticipated that the blowdown flow would increase 18 percent as a result of the EPU. Blowdown for the circulating water system is discharged into the Cedar River. The FES conservatively assumed a blowdown flow rate of 4000 gpm. The actual blowdown flow rate is 1570 gpm and the blowdown flow rate calculated for EPU conditions would be 1850 gpm. During winter, the season which DAEC discharges would have the greatest impact on river water temperature, the actual average blowdown temperature is 30 degrees Fahrenheit (°F) less than that assumed in the FES. The EPU would increase the blowdown discharge temperature by approximately 1.6 °F. Typical discharge temperatures and flow rates are below the current limits so it would not be necessary to modify the NPDES permit to implement the proposed EPU.

Thermal Plume Spread and Temperature of River Water

The actual average blowdown flow rate is 1,570 gpm. The FES assumed a value of 4,000 gpm. The increased values for uprated power blowdown temperature and flow are still bounded by the calculation of the FES. Consequently, the FES conclusions remain valid. The FES concluded that the thermal plume would be less than 1 acre in area and would reach less than a quarter of the reach across the river. The EPU would increase the discharge temperature by 1.6 °F and the flow rate by 18 percent. However, the EPU would not noticeably increase the plume size.

Under worst-case winter conditions, the 2 °F isotherm was predicted to extend about 250 feet downstream with a width of about 70 feet. A discharge temperature of 72 °F for the month of

January was analyzed in the FES. Historically, in winter, when discharges would have the greatest impact on river water temperature, the actual average blowdown temperature is 30 °F less than that assumed in the FES. The average discharge temperature (from 1961 to 1990) for the month of January was 36 °F, and, as stated above, the EPU would increase the discharge temperature by only 1.6 °F. Consequently, the actual size of the thermal plume is smaller than predicted in the FES.

Under worst-case summer conditions, with the same assumptions and data used to calculate the circulating water discharge temperature, the 2 °F isotherm was predicted to extend about 75 feet downstream of the discharge point with a width of about 35 feet. Thermal mapping conducted in August 1989, demonstrated the conservative nature of the assumptions in the FES. The mapping was performed at 100-percent reactor power. The 2 °F isotherm extended to between 100 and 150 feet downstream, and was restricted to within 10 feet of the bank (i.e. 10 feet wide). At 150 feet downstream, there was no detectible plume. The total plume area was less, therefore, than that predicted for the 2 °F isotherm in the FES, and, as stated above, the EPU would not noticeably increase the plume size. The staff concludes the plumes for both summer and winter cases are bounded by the FES. The conditions analyzed in the FES would be expected to remain valid under the proposed EPU conditions.

Cold Shock

Cold shock to an aquatic biota occurs when the warm water discharge from a plant abruptly stops because of an unplanned shutdown, resulting in a temperature drop of the river water and the possible adverse impact on aquatic biota. The probability of an unplanned shutdown is independent of a power uprate. As discussed previously, the discharge canal temperature at EPU conditions would be at least 10 °F less than the value evaluated in the FES. Additionally, the plume size would not increase appreciably under power uprate conditions and would be smaller than analyzed in the FES. Therefore, the risk of aquatic biota mortality by cold shock would continue to be bounded by the conclusions in the FES.

Hazardous Waste Generation and Air Emissions

Hazardous waste generated from routine plant operations and air emissions from the plant heating boiler and diesel generators are controlled by county permits. A power uprate would not have a significant impact on the quality or quantity of effluents from these sources, and operation under EPU conditions would not reduce the margin to the limits established by the applicable permits. Therefore, the conclusions in the FES would remain valid.

Terrestrial Biota Impacts

The proposed EPU would not result in a land disturbance that could adversely impact the habitat of any terrestrial plant or animal species. The licensee stated that according to a recent review by the IDNR, there were no known rare or endangered terrestrial species within the area of the site boundary. Additionally, the licensee stated that land use would remain the same as evaluated in the FES. Therefore, the staff's conclusions in the FES about the impact on terrestrial ecology, including endangered and threatened plant and animal species, would remain valid for the proposed EPU.

Aquatic Biota Impacts

The impacts of operation of the river water intake include impingement of fish on the traveling screens at the intake structure and the entrainment of benthic organisms. The losses associated with the impingement and entrainment of organisms were assessed in the FES and were judged to be insignificant. The effect of the EPU on the impingement and entrainment of organisms also would be insignificant. Fish impingement totals are typically less than 500 fish per year and are considered to be very low, considering the size and composition of the fish population in the Cedar River. Additionally, the licensee stated that there were no known rare or endangered aquatic species in the plant site vicinity. Therefore, the staff's conclusions in the FES as to impingement, entrainment, and endangered and threatened aquatic species would remain valid for the proposed EPU.

Transmission Facility Impacts

Environmental impacts, such as exposure to electromagnetic fields (EMFs) and shock could result from a major modification to transmission line facilities. However, the licensee stated that no change would be made to the existing transmission line design or operation as a result of the proposed EPU. Higher main transformer capacity would be necessary to deliver the additional power to the offsite grid and certain modifications to offsite substations are being planned to enhance stability at various grid locations. These modifications are consistent with Alliant's program of systematic improvements in grid stability and its commitments to the Mid-Continent Area Power Pool and the Mid-America Interconnected Network; modifications would be performed within existing substations. Therefore, no significant environmental impacts from any changes in transmission facilities design and equipment are expected, and the conclusions in the FES would remain valid.

The rise in generator output associated with EPU would slightly increase the current and the EMFs in the onsite transmission line between the main generator and the plant substation. The line is located entirely within the fenced, licensee-controlled boundary of the plant, and neither members of the public nor wildlife are expected to be affected. Exposure to EMFs from the offsite transmission system is not expected to increase significantly and any such increase is not expected to change the staff's conclusion in the FES that no significant biological effects are attributable to EMFs from high voltage transmission lines.

DAEC transmission lines are designed and constructed in accordance with the applicable shock prevention provisions of the National Electric Safety Code and the EPU would not cause the transmission line design to deviate from the NESC provisions. Therefore, the slight expected increase in current attributable to the proposed EPU does not change the staff's conclusion in the FES that adequate protection is provided against hazards from electrical shock.

Social and Economic Impacts

The staff has reviewed information provided by the licensee regarding socioeconomic impacts, including possible impacts on the DAEC workforce and the local economy. DAEC employs more than 500 people and is a major contributor to the local tax base. DAEC personnel also contribute to the tax base by paying sales and property taxes. The proposed EPU would not significantly affect the size of the DAEC workforce and would have no material effect on the labor force required for future outages. Because the plant modifications needed to implement the EPU would be minor, any increase in sales taxes and local and national business revenues would be negligible relative to the large taxes paid by DAEC. It is expected that improving the economic performance of DAEC through cost reductions and lower total bus bar costs per kilowatt hour would enhance the value of DAEC as a generating asset

and lower the probability of early plant retirement. Early plant retirement might have a negative impact upon the local economy and the community as a whole by reducing public services, employment, income, business revenues, and property values, although these reductions might be mitigated by decommissioning activities in the short term. The staff expects that conclusions in the FES regarding social and economic impacts would remain valid under EPU conditions.

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

Summary

In summary, the proposed EPU would not result in a significant change in nonradiological impacts on land use, water use, waste discharges, terrestrial and aquatic biota, transmission facilities, or social and economic factors, and would have no nonradiological environmental impacts other than those evaluated in the FES.

TABLE 1.—SUMMARY OF NONRADIOLOGICAL ENVIRONMENTAL IMPACTS OF AN EPU AT DAEC

Land Use Impacts	No change in land use or aesthetics; would not impact lands with historic or archeological significance.
Water Use Impacts:	
Surface Water Use	Increase in river water withdrawal rate to 3540 MGY; withdrawal rate would remain within permitted levels, and within levels evaluated in the FES.
Groundwater Use	No change in groundwater use.
Discharge Impacts:	
Fogging	Increase in total hours of fogging per year by 1.1 hour.
Icing	No significant change in icing.
Cooling Tower Drift	No significant change in cooling tower drift.
Noise	No significant change in noise.
Chemical and Sanitary Discharge	No expected change to chemical use and subsequent discharge, or sanitary waste systems; cooling towers would operate in the current cycle range. No changes to sanitary waste discharges.
Blowdown	Increase in blowdown by 18°; blowdown would remain within the permitted limits.
Thermal Plume and Temperature of the River Water.	No noticeable increase in thermal plume size. Discharge temperature increase by 1.6 EF; river temperature would remain within National Pollution Discharge Elimination System limit of 9 °F.
Hazardous Waste and Air Emissions	No changes to hazardous waste sources or air emissions.
Terrestrial Biota Impacts	No change in terrestrial biota impacts; no known threatened or endangered species within the site boundary.
Aquatic Biota Impacts	No change in aquatic biota impacts; no known threatened or endangered species in the area of surface water intake or discharge.
Transmission Line Facility Impacts	No change to transmission line design or operation; higher main transformer capacity would be needed to deliver additional power and these changes would be made within existing substations; no change in exposure to EMFs.
Social and Economic Impacts	No significant change in size of DAEC workforce. Few modifications to physical station facility. No significant disturbances from noise, odor, vehicle exhaust, dust, vibration, or shock would be expected from construction.

Radiological Impacts

The staff evaluated radiological environmental impacts on waste streams, in-plant and offsite doses, accident analyses, and fuel cycle and transportation factors. The following is a general description of the waste treatment streams at DAEC and an evaluation of the environmental impacts.

Radioactive Waste Stream Impacts

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

Gaseous Radioactive Waste Impacts

During normal operation, the gaseous effluent systems control the release of gaseous radioactive effluents to the site environs, including small quantities of noble gases, halogens, particulates, and tritium, so that routine offsite releases from station operation remain below the limits of 10 CFR part 20 and appendix I to 10 CFR part 50 (10 CFR part 20 includes the requirements of 40 CFR part 190). The gaseous waste management systems include the offgas system and various building ventilation systems. The proposed EPU assumes an increase in the release rate that is linearly proportional to power increase, and an increase in gaseous effluents would, therefore, occur. The resultant effluent increases in noble gas and iodine-131 activity are 0.3 and 4E–07 microcuries per second, respectively. The staff has evaluated information provided by the licensee and concludes that the estimated dose values would be below Appendix I requirements after the EPU. These dose levels are very small,

and have no significant impact on human helath. The effluents for noble gases and effluents are well below those evaluated in the FES. Therefore, the conclusions in the FES would remain valid under EPU conditions.

Liquid Radioactive Waste Impacts

The liquid radwaste system is designed to process and recycle (to the extent practicable) the liquid waste collected so that annual radiation doses to individuals are maintained below the guidelines in 10 CFR Part 20 and 10 CFR Part 50, Appendix I. DAEC operates as a zero radioactive liquid release plant. The staff expects no change in the zero release policy as a result of the proposed EPU.

Filter backwashing provides decanted sludge water into the liquid radwaste system. Increasing the reactor thermal power by 15 percent would increase the frequency of backwashing necessary to decant backwash water from the reactor water cleanup condensate demineralizer filters by approximately 8 to 10 percent. However, since Alliant maintains a zero radioactive liquid release to the environment, the slight increase in flow to the liquid radwaste system would be recycled instead of discharged.

The EPU conditions would not result in significant increases in the volume of fluid from other sources flowing into the liquid radwaste system. The reactor would 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 would be no changes in reactor recirculation pump seal flow or the flow of any other normal equipment drain path. In addition, there would be no impact on the dirty radwaste or chemical waste subsystems of the liquid radwaste system as a result of the EPU since the operation and the inputs to these subsystems are independent of power uprate. Based on information submitted by the licensee, the staff concludes that no significant dose increase in the liquid pathway would result from the proposed EPU. Therefore, the conclusions in the FES would remain valid under EPU conditions.

Solid Radioactive Waste Impacts

The solid radioactive radwaste system collects, monitors, processes, packages, and provides temporary storage facilities for radioactive solid wastes prior to offsite shipment and permanent disposal. DAEC has implemented procedures to assure that the processing and packaging of wet and dry solid radioactive waste and irradiated reactor components are accomplished in compliance with the regulations.

Wet Waste: The largest volume contributors to radioactive solid wet waste are the spent resin and filter sludges from the process wastes. Equipment waste from operation and maintenance activities, chemical wastes, and reactor system wastes also contribute to solid waste generation. The staff expects that the process wastes generated from the operation of the reactor water cleanup filter demineralizers and the condensate demineralizers will increase by no more than 10 percent. More frequent reactor water cleanup backwashes are anticipated under EPU conditions due to water chemistry limits. The licensee estimates that the backwashes would increase by approximately 8 to 10 percent, resulting in an additional 3 cubic meters of resin waste per year. The resultant total generation rate of approximately 36 cubic meters per year (CMY), is about half the current industry median value of 85 CMY and well below the FES assumed value of 697 CMY. The EPU would not involve changes in either reactor water cleanup flow rates or filter performance. The staff concludes that implementation of the proposed EPU would not have a significant impact on the volume or activity of wet radioactive solid waste at DAEC.

Dry Waste: Dry waste consists of air filters, miscellaneous paper and rags from contaminated areas, contaminated clothing, tools and equipment parts that cannot be effectively decontaminated, and solid laboratory wastes. The activity of much of this waste is low enough to permit manual handling. Dry waste is collected in containers located throughout the plant, compacted as practicable, and then sealed and removed to a controlled-access enclosed area for temporary storage. Because of its low activity, dry waste can be stored until enough is accumulated to permit economical transportation to an offsite processing facility or a burial ground for final disposal. DAEC has indicated that there will be no significant change in the amounts, level of controls, or methodology used for the processing dry radioactive waste at DAEC. The staff concludes that implementation of the proposed EPU should not have a significant impact on the volume or activity of the dry solid radioactive waste at DAEC.

Irradiated Reactor Components: Irradiated reactor components, such as spent control blades, in-core ion chambers, and fuel assemblies, must be disposed of after the life of the component. The volume and activity of waste generated from spent control blades and in-core ion chambers might increase slightly under the higher flux conditions associated with power uprate conditions. This increase would be mitigated by improved longer-lived local power range monitor strings, improved lower-cobalt-content control rod blades, and longer fuel cycles. Additionally, reactor equipment waste is stored in the spent fuel storage pool before removal to in-plant or offsite storage and final disposal in shielded containers or casks. Because of the mitigating effects of extended burnup and increased U–235 enrichment compared to the burnups and enrichment evaluated in the original FES, implementing the EPU would not be likely to have a significant impact on the amount of irradiated reactor components discharged from the reactor.

DAEC plans to load 152 fresh fuel bundles in the initial refueling to commence operation under the EPU. This is approximately 30 bundles more than for the current refueling cycle. 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 would not increase during subsequent reloads. Additionally, the 24-month operating cycle would result in one less fuel reload before the license expiration. These wastes are currently stored in the spent fuel pool and are not shipped off site. The staff concludes that implementation of the proposed EPU should not have a significant impact on the volume or activity of the irradiated reactor components at DAEC.

The staff has generically evaluated the annual environmental impact of low- and high-level solid wastes for a 1000 MWe reference reactor. The estimated activity of these wastes is given in Table S–3 in 10 CFR 51.51 and would be bounding under the proposed EPU conditions.

Dose Impacts

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

In-Plant Radiation

Increasing the rated power at DAEC might increase the radiation levels in the reactor coolant system; however, these potential increases would be compensated for by physical plant improvements and administrative controls, such as shielding, feedwater chemistry, and the plant radiation

protection program. Over the past 7 years, DAEC has decreased the occupational dose to DAEC workers by 15 percent per year (based on a rolling 3-year average). The licensee stated that it expects to continue its downward trend while operating under the proposed EPU conditions. The staff evaluated shielding, dose reduction programs, and corrosion as part of its evaluation.

Shielding: DAEC was conservatively designed with respect to shielding and radiation sources. In the shielding analysis, the assumed concentrations for reactor water fission and corrosion products were 4 microcuries per cubic centimeter and 0.06 microcuries per cubic centimeter, respectively. The normal value of both reactor water fission and corrosion products is 0.01 microcuries per cubic centimeters. With expected increases in operating activity proportional to the proposed power increase, the design shielding assumptions remain bounding at EPU conditions.

Feedwater Chemistry: The original design was based on an assumed value for nitrogen-16 (N–16) concentration of 100 microcuries per gram. To support the injection of hydrogen into the feedwater, the licensee conducted a special test in 1989 to evaluate the impact and efficacy of injection rates of up to 45 standard cubic feet per minute (scfm). The licensee stated that the results of this test led to an injection rate of 6 scfm, which yields an acceptable recirculating system electrochemical potential and no discernable N–16 dose rate increase. Between October 1994 and October 1996, the hydrogen injection rate was increased to 15 scfm to extend corrosion protection to portions of the core internals, with a resultant increase in dose rates of 3.3 times the rates without hydrogen injection. Although occupancy in some areas was restricted, no shielding modifications were required to maintain radiation levels within acceptable levels. Since 1996, DAEC has undertaken a noble metals injection program to protect the core internals from corrosion by reducing hydrogen use. As a result, the current operational hydrogen injection rate is 6.0 scfm. The 20-percent increase in the N–16 dose rate from EPU would not affect the acceptability of the shielding design.

The equilibrium activity concentration of corrosion products that have plated out on reactor coolant piping and other surfaces may theoretically increase by the square of the power uprate increase. This is primarily due to the linear increase in corrosion products in the primary system from the feedwater flow increase and the linear increase in activation events from the core average flux increase. However, this potential increase would be mitigated by four dose reduction programs at DAEC:

1. Oxygen injection in the condensate system started in 1987.
2. Recirculating system chemical decontaminations in 1990, 1992, 1993, and 1995.
3. Stellite reduction efforts started in 1993.
4. Depleted zinc addition started in 1994.

As a result of these efforts, the concentration of soluble cobalt-60 in the reactor water has decreased from 1.3E–04 microcuries per milliliter in early 1987 to 2.7 E–05 microcuries per milliliter in 2000. The potential increases in the volume and activity of activated corrosion products at EPU operating conditions would not negate these efforts, and it is expected that concentrations would continue to decline under EPU conditions. Consequently, operating and shutdown radiation levels would not increase under EPU conditions.

Plant Radiation Protection Program: The plant radiation protection program would be used to maintain individual doses consistent with as-low-as-reasonably-achievable policies and below the established limits of 10 CFR Part 20. Routine plant radiation surveys required by the radiation protection program would identify increased radiation levels in accessible areas of the plant, and radiation zone postings and job planning would 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 a significant margin to regulatory dose limits. The licensee stated that administrative dose limits were not routinely exceeded under present power conditions.

On the basis of the above information, the staff concludes that the expected annual collective dose for DAEC, following the proposed EPU, would still be bounded by the dose estimates in the FES.

Offsite Doses

The slight increase in normal operational gaseous activity levels under the EPU would not affect the large margin to the offsite dose limits established by 10 CFR Part 20. In addition, doses from liquid effluents, currently zero, would remain zero under EPU conditions.

The DAEC Technical Specifications implement the guidelines of 10 CFR Part 50, Appendix I, which are within the 10 CFR Part 20 limits. Adjusting current values for projected EPU increases, the offsite dose at EPU conditions is estimated to be 2.6 E–03 millirads for noble gas gamma air, 1.6E–02 millirads for noble gas beta air, and 6.8E–03 thyroid millirem for particulates and iodine. The Appendix I limits are 10 millirads, 20 millirads, and 15 thyroid millirem, respectively. The offsite dose would continue to be within the Technical Specification dose limits.

The EPU would not involve significant increases in an offsite dose from noble gases, airborne particulates, iodine, or tritium. Radioactive liquid effluents are not routinely discharged from DAEC. In addition, as stated by the Radiological Environmental Monitoring Program for DAEC, radiation from shine is not now a significant exposure pathway, and it would not be significantly affected by the proposed EPU.

The EPU would not create any new or different sources of offsite dose from DAEC operation, and the EPU would not involve significant increases in present radiation levels. Therefore, under EPU conditions, offsite dose would remain well within regulatory criteria and would not have a significant impact. The staff concludes that the estimated doses from both the liquid and gaseous release pathways resulting from EPU conditions are within the design objectives specified by 10 CFR part 50, appendix I, and the limits of 10 CFR part 20.

Accident Analysis Impacts

The staff reviewed the licensee's analyses and performed confirmatory calculations to verify the acceptability of the licensee's calculated doses under accident conditions. The staff concludes that the proposed EPU would not significantly increase the probability or consequences of accidents and would not result in a significant increase in the radiological environmental impact of DAEC under accident conditions. If the license amendment request is approved, the result of the staff's calculations will be presented in the safety evaluation issued with the license amendment.

Fuel Cycle and Transportation Impacts

The EPU would involve an increase in the average enrichment of the fuel bundle. The environmental impacts of the fuel cycle and of transportation of fuel and wastes are described in Table S–3 and S–4 of 10 CFR 51.51 and 10 CFR 51.52, respectively. Table S–3 of 10 CR 51.51 and S–4 of 10 CFR 51.52 were

adopted by the licensee after DAEC received its operating license. Consequently, the DAEC FES does not contain a uranium fuel cycle environmental analysis similar to Table S–3. The impacts of transportation are addressed in the Environmental Report and the FES, although the conclusions are not presented in the format of Table S–4. An NRC assessment (53 FR 30355, dated August 11, 1988, as corrected by 53 FR 32322, dated August 24, 1988) evaluated the applicability of Table S–3 and S–4 to higher burnup cycles and concluded that there is no significant change in environmental impacts for fuel cycles with uranium enrichments up to 5 weight-percent U–235 and burnups less than 60 gigawatt-day per metric ton of uranium (GWd/MTU) from the parameters evaluated in Tables S–3 and S–4. Because the fuel enrichment for the EPU would not exceed 5 weight-percent U–235 and the rod average discharge exposure would not exceed 60 GWd/MTU, the environmental impacts of the proposed EPU would remain bounded by these conclusions and would not be significant.

Summary

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

TABLE 2.—SUMMARY OF RADIOLOGICAL ENVIRONMENTAL IMPACTS OF EPU AT DAEC

Radiological Waste Stream Impacts:	
Gaseous Waste	An increase in release rate that is linearly proportional to the power increase would be expected.
Liquid Waste	No change in DAEC zero liquid release policy.
Solid Waste:	
Wet Waste	Backwashes would increase to create approximately 3 cubic meters of resin per year.
Dry Waste	No significant changes.
Irradiated Components	No significant changes.
Dose Impacts	May potentially increase radiation levels; dose would remain within permitted levels in-plant and offsite.
Accident Analysis Impacts	No significant increase in the probability or consequences of an accident.
Fuel Cycle and Transportation	Increase in bundle average enrichment; impacts would remain within the conclusions of Table S–3 and Table S–4 of 10 CFR Part 51.

Alternatives to the Proposed Action

As an alternative to the proposed action, the staff considered denial of the proposed action (i.e., the ''no-action'' alternative). Denial of the application would result in no change in current environmental impacts. The environmental impacts of the proposed action and the alternative action are similar.

As stated previously, the estimated cost of adding this nuclear generating capacity is approximately half the cost projected for purchasing the power and one-third the cost of producing the power by constructing a new combined-cycle, natural-gas-fueled facility. Alliant concluded that increasing DAEC's capacity would be the most economical option for increasing power supply. Furthermore, unlike fossil fuel plants, DAEC does not routinely emit sulfur dioxide, nitrogen oxides, carbon dioxide, or other atmospheric pollutants that contribute to greenhouse gases or acid rain.

Alternative Use of Resources

This action does not involve the use of any resources different than those previously considered in the FES for DAEC, dated March 1973.

Agencies and Persons Consulted

In accordance with its stated policy, on August 23, 2001, the NRC staff consulted with the Iowa State official, Mr. D. McGhee of the Department of Public Health, regarding the environmental impact of the proposed action. The State official had no comment.

Finding of No Significant Impact

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

For further details with respect to the proposed action, see the licensee's application dated November 16, 2000, as supplemented April 16 (two letters) and 17; May 8 (two letters), 10, 11 (two letters), 22, and 29; June 5, 11, 18, 21, and 28; July 11, 19, and 25; and August 1, 10, 16, and 21; and October 17, 2001, and NMC's ''Supplement to DAEC Environmental Report,'' submitted on September 22, 2000. Documents may be examined and/or copied for a fee at the NRC's Public Document Room, at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the ADAMS Public Library component on the NRC Web site, *http://www.nrc.gov* (the Electronic Reading Room). If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC Public Document Room Reference staff at 1–800–397–4209, or 301–415–2737, or by e-mail at *pdr@nrc.gov.*

Dated at Rockville, Maryland, this 31st day of October 2001.

For the Nuclear Regulatory Commission.

William D. Reckley,

Acting Chief, Section 1, Project Directorate III, Division of Licensing Project Management, Office of Nuclear Reactor Regulation.

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NUCLEAR REGULATORY COMMISSION

Advisory Committee on Reactor Safeguards; Meeting of the Subcommittee on Reactor Fuels

Notice of Meeting

The ACRS Subcommittee on Reactor Fuels will hold a meeting on November