NUCLEAR REGULATORY COMMISSION

[Docket No. 50–368]

Entergy Operations, Inc., Arkansas Nuclear One, Unit 2; Environmental Assessment and Finding of No Significant Impact Related to a Proposed License Amendment to Increase the Maximum Thermal Power Level

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an amendment to Facility Operating License No. NPF–6, issued to Entergy Operations, Inc. (Entergy or the licensee), for the operation of Arkansas Nuclear One, Unit 2 (ANO–2), located in Pope County, Arkansas. Therefore, as required by 10 CFR 51.21, the NRC is issuing this environmental assessment and finding of no significant impact.

Environmental Assessment

Identification of the Proposed Action

The proposed action would allow Entergy, the operator of ANO–2, to increase its electrical generating capacity at ANO–2 by raising the maximum reactor core power level from 2815 MWt to 3026 MWt. This change is approximately 7.5 percent above the current maximum licensed power level for ANO–2. The change is considered an extended power uprate (EPU) because it would raise the reactor core power level at least 7 percent above the original licensed power level. ANO–2 has not submitted a previous power uprate application. The 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. As a result, more heat will be rejected to the circulating water and cooling tower complex. Increased heat load to the cooling tower will cause evaporative losses to increase. Therefore, cooling tower makeup, supplied from Lake Dardanelle, will increase due to the increased evaporative losses.

The proposed action is in accordance with Entergy's application for amendment dated December 19, 2000, as supplemented by letters dated May 30, June 20, 26 (two letters), 27, and 28, July 3 and 24 (two letters), August 7, 13, 21, 23, and 30, September 14, October 1, 12 (two letters), 17, 30 (two letters), and 31, November 9, 16 (three letters), and 17, and December 5, 6 (two letters), 10, and 20, 2001, and January 14, 15, and 31, February 7 (two letters), and March 1, 2002.

The Need for the Proposed Action

The proposed action is to provide an option that allows for power generation capability beyond the current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than NRC) decisionmakers. The ANO–2 steam generators were replaced in 2000 due to primary water stress corrosion cracking. In evaluating the options for the replacement steam generators (RSGs), Entergy determined that the RSGs would be capable of supporting a 7.5 percent thermal uprate which would increase the licensed core thermal power level to 3026 MWt. The proposed action to increase the licensed core thermal power level to 3026 MWt is based on Entergy's operational goal of increasing electrical generating capacity. According to Entergy, summer peak temperatures in the South challenge the ability of Entergy and other power producers to meet peak load demands, and nuclear power has been shown to be a reliable energy source during these peak periods.

In addition, Entergy states that there is an ongoing need for existing Entergy system generating capacity, including that provided by ANO–2. Entergy also states that load growth is expected to further increase the system's resource requirements. In view of the foregoing, Entergy determined that the EPU for ANO–2 would provide an economically sound choice with no significant impact to the environment.

Environmental Impacts of the Proposed Action

The NRC has completed its evaluation of the proposed action and concludes that the increase in the rated core thermal power can be accomplished without significant impact on the environment.

The environmental impacts of ANO–2 have been described in (1) the Final Environmental Statement (FES), dated June 1977 (NUREG–0254); (2) the Power Uprate Licensing Report (PULR), which is Enclosure 5 to the EPU application dated December 19, 2000, as supplemented; and (3) the June 26 and December 10, 2001, and January 15, 2002, responses to NRC requests for additional information (RAI). On January 31, 2000, Entergy submitted a supplement to its environmental report supporting the license renewal of Arkansas Nuclear One, Unit 1 (ANO–1), which resides adjacent to ANO–2. Responses to NRC RAIs regarding the environmental report for license renewal were submitted on June 26, July 31, and September 21, 2000. The staff evaluation of that action was documented in NUREG–1437, Supplement 3, ''Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Regarding Arkansas Nuclear One, Unit 1,'' September 2000 (Supplement 3). Supplement 3 addresses many balance-of-plant site features that are common to ANO–1 and ANO–2. Supplement 3 was cited in Enclosure 5 of the December 19, 2000, license application in instances where site characteristics common to both ANO–1 and ANO–2 are unchanged by the EPU.

The original operating license for ANO–2 allowed a maximum reactor power level of 2815 MWt. Based upon on its independent analyses of the non-radiological and radiological impacts, as described in more detail below, the staff has determined that the environmental impacts of the proposed EPU are essentially unchanged from the environmental impacts previously evaluated in the staff's FES and, as common to both units, Supplement 3. The EPU does not involve extensive changes to plant systems that directly or indirectly interface with the environment. Additionally, no changes are necessary to the National Pollutant Discharge Elimination System (NPDES) permit issued by the Arkansas Department of Environment Quality (ADEQ), formerly the Arkansas Department of Pollution Control and Ecology.

Non-Radiological Impacts

The following contains the NRC staff's analysis of the non-radiological environmental impacts of the proposed EPU on land use, water use, waste discharges, terrestrial and aquatic biota, transmission facilities, and social and economic conditions at ANO–2.

Land Use Impacts

The proposed EPU would not modify land use at the site or have impacts on lands with historic or archeological 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 proposed 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 conclusions in Supplement 3 for impacts on land use that are common to

ANO–1 and ANO–2, and the conclusions on land use impacts in FES Section 5–2, augmented by information in the PULR and the June 26 and December 10, 2001, and January 15, 2002, RAI responses, will remain valid under the proposed EPU conditions.

Noise was not addressed in the FES. However, FES Section 5.2 notes that Arkansas Nuclear One (ANO) is located on 1,164 acres and FES Section 2.2.2 states that the ''* * * station has altered the land use in Pope County, primarily through the conversion of 430 acres to an industrial site. Only 150 acres actually are being disturbed * * * The total acreage of the land affected by the construction and operation of ANO is extremely small. Most of the changes in land use have occurred with the construction and operation of Unit 1. * * *'' Supplement 3, Section 2.1 states that ''[t]he ANO site is located on a peninsula formed by Lake Dardanelle, and three sides of the site are surrounded by lake water.'' The two nearest residences are ''* * * approximately 3 and 1.2 miles, respectively, from the Unit 2 containment building centerline* * *'' (ANO–2 Environmental Report (ER) Section 2.2.3.2. The ANO–2 ER was submitted on March 1, 1974, and amended on July 11 and December 13, 1974, June 13, October 6 and December 19, 1975, and June 21 and September 8, 1976.) The EPU will not change the character, sources, or energy of noise generated at ANO–2. Modified structures, systems, and components necessary to implement the proposed EPU will be installed within existing plant buildings and no noticeable increase in ambient noise levels within the plant is expected.

Water Use Impacts

The following is the NRC staff's evaluation of ground and surface water use as environmental impacts of water usage at ANO–2. Ground and surface water use impacts are also discussed in the ''Radiological Impacts'' section below.

Groundwater Use

As stated in the RAI response to the NRC staff dated June 26, 2001, ANO–1 and ANO–2 do not use any groundwater. Therefore, the EPU will have no non-radiological effects on groundwater.

Surface Water Use

The 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 licensee has stated that, as a result, more heat will be rejected to the circulating water and cooling tower complex. Increased heat load to the cooling tower will cause a slight increase in evaporative losses. Therefore, cooling tower makeup, supplied from Lake Dardanelle, will slightly increase due the increased evaporative losses.

While the EPU will require increased water use, the licensee has stated that ANO–2 will not use more water from the lake than permitted. ANO–2 has a contract with the U.S. Corps of Engineers that allows water to be withdrawn from the lake at an average rate of 22 ft ^{3}/sec; withdrawals can exceed this average without an adverse environmental impact. An average evaporation rate of 22 ft^3/sec (9,900 gpm) and maximum evaporation rate of 27 ft^3/sec (11,900 gpm) was analyzed in FES Section 5.3.4. PULR Section 10.4.1.2, stated that the maximum cooling tower make-up for evaporation will increase from 12,180 (27.1 ft^3/sec) to 13,020 gpm (29.0 ft^3/sec) under EPU conditions. However, by allowing the cooling tower cycles of concentration to increase from 3.5 to 3.8, still a low concentration value, cooling tower evaporation at design conditions will be about 11,600 gpm (25.8 ft^3/sec). (While water will also be withdrawn from the lake at a rate of 4,150 gpm (9.2 ft^3/sec) to satisfy blowdown needs, this water is returned to the lake.) Cooling tower design conditions continue to be 81.0 °F wet bulb temperature (Wbt) and 37.0 percent relative humidity. These are conservative values. The meteorological worst day on record, July 17, 1934, reflects a worst average 4-hour Wbt and relative humidity of 82.4 °F and 59.20 percent, respectively. The Wbt during this worst 4-hour period exceeds the tower design temperature by only 1.4 °F and the relative humidity was 22.2 percent higher than design.

The limits on withdrawal (i.e., consumption via evaporation) from Lake Dardanelle are based on economics. By withdrawing from the lake, less stream flow is available to flow through Corps of Engineers' hydroelectric generation plants. The licensee compensates the Corps of Engineers for reduction of the flow of the stream (Lake Dardanelle), and the resultant power generation losses to its hydroelectric projects (see FES Section 5.3.4), and will continue to do so for any additional water withdrawal from Lake Dardanelle as a result of the EPU under the terms of the contract.

Surface water hydrology is discussed in ER Sections 2.5.1 and 5.1.3, and FES Section 2.3.2. The EPU results in no increase in the water use permitted. In addition, any changes would be subject to approval by the ADEQ and subject to the NPDES permit. Accordingly, the NRC staff finds that the licensee's conclusions that ANO–2 ''cooling water facilities will have no adverse effects on the local environment, agriculture, housing, roads, airports, and other facilities,'' and that ''* * * measures are being provided to control the formation of slime and algae in the circulating water system, without causing unnecessary harm to aquatic life and biota,'' remains true for the EPU. In addition, FES Section 2.3.2 statements remain unaffected by the EPU. See the discussion below on drift regarding replacing chlorination with bromination at ANO–2.

Waste Discharge Impacts

The NRC staff evaluated the 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 lake, cold shock to aquatic biota, hazardous waste effluents, and air emissions that were presented in the FES. The NRC staff, as set forth below, finds that the proposed EPU causes no significant change to the FES evaluations and conclusions relating to waste discharge.

Cooling Tower Fogging, Icing, Drift

The ANO–2 cooling tower is discussed extensively in FES Section 5.4. Entergy's predecessor prepared the ANO–2 ER and submitted its seventh and final amendment attached to a September 8, 1976, letter. As stated in Section 10.1 of the ER, several types of cooling systems such as a cooling pond, a spray pond, a mechanical draft cooling tower, and dry cooling towers were evaluated before a natural draft cooling tower was selected as the best option.

Fogging, Icing and Drift

The licensee has stated in ER Section 10.1.6.3.C, that based on studies done at the Keystone Station in Pennsylvania, ''[f]logging and icing were not problems in the area surrounding these towers.'' This ER section also noted that ''* * * the physical conditions at the Arkansas Nuclear One site were comparable to the installation at Pennsylvania, and the winters less severe.'' The NRC staff found that fogging and icing caused by cooling tower evaporation and drift has either a ''minimal'' or no effect on ground transportation, air transportation, and water transportation, and is not affected by the EPU.

In Section 10.4.1.2 of the PULR, the increase in circulating water makeup

rate is approximately 840 gpm (1.87 ft^3/sec) due to increased evaporation. As stated above, makeup due to evaporation will increase. However, PULR Section 10.4.1.4 states that the circulating water flow rate actually decreased slightly after the condenser was refurbished during a recent refueling outage (2R13). Since drift is a function (i.e., is some fractional amount) of circulating water flow rate, the NRC staff finds that the drift due to the proposed EPU will not exceed that evaluated in the FES.

FES Section 5.4.1.1 assesses cooling tower drift. In this section, the licensee states that ''[c]hlorides were selected by the staff as the primary component of TDS [total dissolved solids] which may cause potential vegetation damage above certain deposition rates.'' The chlorination system for biological control was revised to include a bromination process for the circulating water systems on both ANO–1 and ANO–2 in early 1990. Chlorination was abandoned in 1991 in lieu of the preferred bromination process. This approach was discussed in a follow-up ANO response to Generic Letter 89–13, ''Service Water System Problems Affecting Safety-Related Equipment,'' in 1992.

Since drift has not increased and the evaporation increase is relatively small, the NRC staff finds that the conclusions of the ER and FES regarding fogging, icing, and drift are not altered due to the proposed EPU.

Chemical and Sanitary Discharges

Surface water and wastewater discharges are regulated by the ADEQ. The NPDES permit is periodically reviewed and reissued by the ADEQ. The present NPDES permit for ANO–2 authorizes discharges from nine outfalls, only one of which will be affected by the EPU. The one affected outfall is the cooling tower blowdown that is addressed below.

The use of chemicals and their subsequent discharge to the environment will not change significantly as a result of the EPU. The cooling tower concentration cycle will remain a low concentration value (3.8). Therefore, the NRC staff concludes that concentration of pollutants in the effluent stream will remain low.

Sanitary wastes are described in ER Section 3.7.1 and ANO–2 Safety Analysis Report Section 9.2.4.2. Sanitary wastes from ANO–2 are discharged directly to the ANO–2 sewage treatment plant in accordance with a permit issued by the ADEQ. Since there is no increase in the ANO staff as a result of the EPU, there is no increase in sanitary waste. Therefore, the EPU requires no changes to the sanitary waste systems or to the parameters regulated by the NPDES permit.

Blowdown

The NRC staff evaluated blowdown, which is discussed in PULR Section 10.4.1.2. As discussed in the ANO–2 Safety Analysis Report Section 10.4.5, Circulating Water, the cooling tower blowdown system, which discharges through the Unit 1 discharge flume, maintains the concentration of the circulating water below the solubility limit of calcium sulfate, thereby preventing condenser tube scale precipitation.

FES Section 5.3.2 evaluated the concentrating effect of evaporation of cooling tower water. The FES states that ''[s]ubstances brought into the circulating water system with the makeup will be concentrated by a factor which will range from 3 to 14 due to evaporation of the water in the cooling tower.'' The licensee states that the EPU will not increase the number of cooling tower concentration cycles beyond this range. Cycles of concentration will remain at the lower end of the range cited, as discussed below. Therefore, the NRC staff concludes that current water appropriation limits are maintained and the conclusions in the FES will remain valid under the EPU conditions.

As stated in the section above, additional cooling tower evaporation will require a small (1.87 ft^3/sec) increase in cooling tower makeup rate. However the blowdown rate will only increase slightly or be kept at the current rate. With blowdown rate at the current rate, cooling tower cycles of concentration will increase by about 0.3 from approximately 3.5 to 3.8. The effect is negligible with either maintaining the current blowdown rate by increasing cycles of concentration or with increasing blowdown. This is because the blowdown is normally mixed with the ANO–1 circulating water system discharge, which has a flow rate of 383,000 gpm (853 ft^3/sec) with two of the four circulating water pumps in operation. Mixing of the blowdown with the Unit 1 circulating water is discussed in FES summary and conclusion paragraph 3.b and Section 5.3.2.

There are no blowdown flow limitations established in ANO NPDES Permit Number AR0001392, issued by ADEQ. Other parameters such as pH, free available chlorine, and total zinc will continue to be monitored in accordance with the permit to ensure that State water quality standards are met.

Thermal Plume Spread and Temperature of Lake Dardanelle

These two topics are discussed in PULR Section 10.4.1.3. As stated above, the ANO–2 cooling tower makeup rate will increase by 840 gpm (1.87 ft^3/sec) from 12,180 (27.1 ft^3/sec) to 13,020 gpm (29.0 ft^3/sec), but blowdown will remain at essentially the current rate. As stated above, this blowdown is normally mixed into the ANO–1 circulating water system discharge, which has a greater flow rate. Since the blowdown temperature will increase by less than 1 °F due to the EPU, the effect of the EPU on thermal plume spread and Lake Dardanelle temperature is negligible.

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 rapid temperature drop of the discharge water to the lake and possible adverse impact on aquatic biota. The FES does not discuss cold shock caused by an unplanned trip of ANO–2, and the likelihood of an unplanned shutdown is independent of a power uprate. As stated above, the ANO–2 blowdown is normally mixed with the much larger ANO–1 circulating water discharge. An unplanned shutdown of ANO–1 can cause cold shock as evaluated in Supplement 3. However, even if the ANO–1 circulating water pumps are not in service, the amount of ANO–2 blowdown flow into Lake Dardanelle at the ANO–1 circulating water discharge, even at EPU conditions, is too small to cause cold shock. The NRC staff concludes that the risk of aquatic biota mortality by cold shock is not applicable to ANO–2 even at the proposed EPU conditions. Therefore, the discussion in FES Section 5.4.2 regarding winter lake water temperature effects on shad (FES pages 5–8 and 5–9) remains unchanged.

Hazardous Waste Generation and Air Emissions

As stated in PULR Section 10.4.1.4, ANO holds an Air Permit that was issued and is monitored by the ADEQ Air Division. This permit identifies emission sources at ANO. These sources include, but are not limited to, emergency diesel generators, plant heating boilers, cooling tower, start-up boiler, and bulk storage tanks.

ANO generates hazardous waste from routine plant operations. ANO has a hazardous waste generator's identification number assigned by the

ADEQ Solid Waste Division. ANO files Annual Hazardous Waste Reports to the ADEQ.

The EPU has no impact on the quality or quantity of effluents from these sources, and operation under EPU conditions will not reduce the margin to the limits established by the applicable permits.

Terrestrial Biota Impacts

The licensee states that the EPU will not change the previously evaluated land use at ANO and will not disturb the habitat of any terrestrial plant or animal species. There are no significant increases in previously evaluated environmental impacts from cooling tower operation at EPU conditions.

According to a 1999 review by the Arkansas National Heritage Commission, documented in Supplement 3, Section 4.6, there are no known rare or endangered plant species within the area of the site boundary. As stated in Supplement 3, Section 4.6, the Arkansas Natural Heritage Commission and the U.S. Fish and Wildlife Service have recently stated (June 2000) that no endangered species have been identified at the ANO site or along the transmission rights-of-way. This is consistent with the subsection on ''Fishes'' in FES Section 2.5.1. (See the first paragraph after FES Table 2.4.)

As stated in the June 2001 environmental impact RAI response, the EPU will not disturb land, and land use will remain unchanged. The EPU will not adversely impact the habitat of any terrestrial plant or animal species. There are no deleterious effects on the diversity of biological systems or the sustainability of species due to the EPU, and it does not involve additional changes to the stability or integrity of ecosystems. Therefore, the NRC staff has concluded that the description of the impact on terrestrial ecology, including endangered and threatened plant and animal species, will remain valid for the EPU.

Aquatic Biota Impacts

ANO–1 has a traveling water screen system that protects the suction to both its large circulating water pumps and the much smaller safety-related service water pumps. This same traveling water screen system is used for ANO–2, only for its safety-related service water pumps. The licensee indicates that the EPU does not require larger service water pumps, and the pumps were evaluated at their permitted flowrate as part of the NPDES permit. Therefore, the EPU will have no increased impact on the traveling water screen system. The effect of the proposed EPU on the impingement and entrainment of organisms is unchanged and, therefore, remains insignificant. Therefore, the NRC staff conclusions regarding impingement, entrainment, and endangered and threatened aquatic species as discussed in FES Sections 2.5.1 and 5.4.2, and Supplement 3 Section 4.1.1 will remain valid for the EPU. The EPU does not affect ANO's compliance with Sections 316(a) or 316(b) of the Federal Water Pollution Control Act.

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 states that no change is being made to the existing transmission line design or operation as a result of the EPU. As stated in one of the licensee's supplemental letters dated October 30, 2001, main transformer capacity is adequate to deliver the additional power to the offsite grid. Grid stability is addressed in PULR Section 2.2.1, which cites ANO procedure changes to avoid grid instability with either the Mablevale or Pleasant Hill 500 kV line out of service or during minimum load conditions. These modifications are consistent with Entergy's program of maintaining grid stability. Therefore, the NRC staff concludes that no significant environmental impacts from any changes in transmission facility design and equipment are expected, and the conclusions of FES Sections 3.3, 4.2, and 5.2 remain valid.

The generator output associated with the EPU will 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, ANO-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 any conclusion in FES Section 5.4.1.3 that no significant biological effects are attributable to EMFs from high voltage transmission lines.

ANO–2 transmission lines are designed and constructed in accordance with the applicable shock prevention provisions of the National Electric Safety Code and the EPU will not cause the transmission line design to deviate from these provisions. Therefore, the NRC staff concludes that the expected increase in current attributable to the EPU does not change the conclusion in FES Section 5.4.1.3 (i.e., adequate protection is provided against hazards from electrical shock).

Social, Economic, and Physical Impacts

The NRC staff has reviewed information provided by the licensee regarding the social, economic, and physical impacts associated with the EPU. ANO employs more than 1,000 people and is a major contributor to the local tax base. The EPU will not significantly affect the size of the ANO workforce and will have no material effect on the labor force required for future outages. Because the plant modifications needed to implement the EPU will be minor, any increase in sales taxes and local and national business revenues will be negligible relative to the large amount of taxes paid by ANO. It is expected that improving the economic performance of ANO–2 through cost reductions and lower total bus bar costs per kilowatt hour will enhance the value of ANO–2 as a generating asset and lower the probability of early plant retirement.

Early plant retirement would have a negative, long-term impact upon the local economy and the community as a whole by reducing public services, employment, income, business revenues, and property values. Conclusions in FES Section 10 and Supplement 3 regarding social and economic impacts and benefits from ANO remain valid under EPU conditions for ANO–2.

The potential for direct physical impacts of the EPU, such as vibration and dust from construction activities, has been considered. The EPU will be accomplished primarily by changes in station operation and few physical modifications to the facility. These limited modifications will be accomplished without physical changes to transmission corridors, access roads, other offsite facilities, or additional project-related transportation of goods or materials. Therefore, the NRC staff concludes that no significant additional construction disturbances causing noise, odors, vehicle exhaust, dust, vibration, or shock from blasting are anticipated, and the conclusions in FES Sections 4.1 and 5.2 remain valid.

Summary

In summary, the NRC staff has concluded that the EPU will not result in a significant change in non-radiological impacts on land use, water use, waste discharges, terrestrial and aquatic biota, transmission facilities, or social and economic factors, and will have no non-radiological environmental impacts other than those evaluated in

the FES. Table 1 provides a tabular summary of the non-radiological results.

TABLE 1.—SUMMARY OF NON-RADIOLOGICAL ENVIRONMENTAL IMPACTS OF POWER UPRATE

Land Use Impacts	No change in land use or aesthetics; will not impact lands with historic or archeological significance. No significant impact due to noise.
Water Use Impacts:	
Groundwater Use	No groundwater use.
Surface Water Use	There is only a small increase in water withdrawal (i.e., for consumption) rate from the lake. The maximum consumption rate will remain at 27ft^3/sec which is within permitted levels.
Waste Discharge Impacts:	
Cooling Tower Fogging, Icing, Drift	Fogging, evaluated as minimal in ER Table 10.1–2. Remains minimal for EPU. No significant change in icing. Icing, evaluated as minimal in ER Table 10.1–2. Remains minimal for EPU. No significant change in cooling tower drift per PULR 10.4.1.4.
Chemical and Sanitary Discharges	No expected change to chemical use and subsequent and discharge, or sanitary waste systems; cooling towers will operate in the current cycle range. No changes to sanitary waste discharges.
Blowdown	Increase in blowdown discussed in PULR Section 10.4.1.2. Maximum 9.2 ft^3/sec blowdown normally mixed with 853 ft^3/sec circulating water system discharge from ANO–1's once-through cooling system. Blowdown remains within permitted limits.
Thermal Plume Spread and Temperature of Lake Dardanelle.	Negligible and unnoticeable increase in thermal plume size. No discharge temperature increase; lake temperature primarily affected by ANO–1 once-through cooling system; remains in NPDES limit.
Cold Shock	Risk of aquatic biota mortality by cold shock is not applicable to ANO–2; discussed in FES Section 5.4.2.
Hazardous Waste Generation 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 Facility Impacts	No change to transmission line design or operation; main transformer capacity to deliver additional power is unchanged; no significant change in exposure to EMFs.
Social, Economic, and Physical Impacts	No significant change in the local economy. Few modifications to physical station facility.

Radiological Impacts

The NRC staff has 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 ANO–2 and an evaluation of the environmental impacts. The NRC finds that the proposed EPU will not cause any radiological effects to surface water in the station environs. Even though there is no discussion in the ANO–2 FES regarding radiological impacts on surface water, ER Table 10.1–2 states that the impact on groundwater due to chemical, radionuclides, or ''other'' impacts is ''NA'' (i.e., not applicable). As stated in ER Section 2.5.2, Ground Water Hydrology, ''[c]ontamination of underground water by radioactivity presupposes the discharge of radioactive liquids from a leaking or ruptured tank into the general environs of the plant site.''

As discussed in ER Section 7.1, the liquid released by the rupture of any tank in the Boron Management System or Waste Management System will be contained within the Auxiliary Building and safely processed. This statement remains true for the EPU as does the FES statements regarding the refueling water tank.

Radiological Waste Stream Impacts

ANO–2 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 10 CFR Part 50, Appendix I, ''Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion ''As Low As Is Reasonably Achievable'' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents.'' These radioactive waste treatment systems are discussed in the FES. The proposed EPU will not affect the environmental monitoring of these waste streams or the radiological monitoring requirements contained in licensing basis documents. The proposed EPU does not result in any changes in operation or design of equipment in the gaseous, liquid, or solid waste systems. The proposed EPU will not introduce new or different radiological release pathways and will not increase the probability of an operator error or equipment malfunction that will result in an uncontrolled radioactive release. The NRC staff evaluated the changes in the gaseous, liquid, and solid waste streams for radiological environmental impact of the proposed EPU, which are 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. 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, ''Environmental Radiation Protection Standards for Nuclear Power Operations''). The gaseous waste management systems include the offgas system and various building ventilation systems. The EPU results in an increase in the release rate that is assumed to be linearly proportional to the power increase. An increase in gaseous effluents is, therefore, assumed to occur. The resultant effluent increases in noble gas and iodine-131 activity are 4.98E–02 μCi per second and 0.00E+00 μCi per second, respectively. A release rate of zero is assumed for iodine because no iodine has been released over the past three years. The estimated dose values will be below 10 CFR Part 50, Appendix I requirements after the EPU. These dose

levels are very small and have no significant impact on human health.

Averaging ANO–2's dose for the three most recent years and adding the effect of the EPU on gamma in air and beta in air, results in EPU dose rates of 6.92E–04 and 2.15E–03 millirad per year (mrad/yr), respectively. Comparing these dose rates to same-type dose rates in FES Table 5.7 demonstrates that ANO–2 is not only far below the RM–50–2 [1] design objective values of 10 mrad/yr and 20 mrad/yr for gamma and beta, respectively, but that the EPU dose rates for gamma and beta are about 86 and 884 times lower, respectively, than the calculated dose for gamma (0.06 mrad/yr) and beta (1.9 mrad/yr) listed in the FES table. A 3-year average allows averaging with and without refueling outages.

Similarly, the 3-year average plus projected EPU dose rate for iodine, tritium, and particules (ITP) is 1.56E–02 millirem per year (mrem/yr). Again, this EPU ITP dose rate is not only far below the RM–50–2 design objective dose rate of 15 mrem/yr, but is also about 192 times lower in dose consequence than the 3.0 mrem/yr calculated dose for ITP in the FES table.

These low dose rates projected for the EPU, when combined with the most recent 3-year average, clearly demonstrate that ANO–2 has been successful in maintaining a very low exposure to plant personnel and the public of both gaseous and liquid (see below) effluent doses. The NRC staff has evaluated the information provided by the licensee and concludes that the estimated dose values for gaseous radioactive wastes will be below Appendix I requirements after the EPU.

Liquid Radioactive Waste Impacts

The liquid radwaste system is designed to process and recycle, to the extent practicable, the liquid waste collected. Annual radiation doses to individuals are maintained below the guidelines in 10 CFR Part 20 and 10 CFR Part 50, Appendix I. As set forth below, the NRC staff expects that there will be no change in the release policy as a result of the EPU.

The licensee has stated that EPU conditions will not result in significant increases in the volume of fluid from sources flowing into 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 cooling pump seal flow or the flow of any other normal equipment drain path. In addition, there will 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 the power uprate. No significant dose increase from the liquid pathway will result from the EPU. Therefore, the conclusions in the FES are expected to remain valid under EPU conditions, as demonstrated by the following comparison.

Averaging ANO–2's dose for the three most recent years and adding the effect of the EPU on the liquid effluents dose rate to the total body, or any organ, for all pathways results in a calculated dose of 1.04E–2 mrem/yr. Comparing this dose to the liquid effluent doses in FES Table 5.7 demonstrates that ANO–2 is not only far below the RM–50–2 design objective of 5 mrem/year but that the EPU dose rate is about 30 times lower than the calculated dose of 0.31 mrem/yr listed in the FES.

Solid Radioactive Waste Impacts

The solid radioactive waste system collects, monitors, processes, packages, and provides temporary storage facilities for radioactive solid wastes prior to offsite shipment and permanent disposal. Entergy has implemented procedures to assure that the processing and packaging of wet and dry solid radioactive waste and irradiated reactor components at ANO–2 are accomplished in compliance with regulations. Entergy continually tracks the volume of solid radioactive waste generated at ANO; however, the total is not isolated by unit (i.e., ANO–1 or ANO–2). From 1995 to the present, ANO–1 and ANO–2 generated 78,787 ft ^{3} of low-level radioactive waste for an average of about 12,097 ft^3 per year. In 2000, ANO generated a peak volume of 25,107 ft^3 of low-level radioactive waste. The majority of the waste was generated as a result of the ANO–2 outage involving replacement of the steam generator.

Wet Waste: The largest volume contributors to radioactive solid wet waste are low-specific-activity spent secondary resins. Historically, this has accounted for more than 50 percent of the total volume of wet radioactive waste generated annually. Since the completion of the ANO–2 steam generator replacement outage, no secondary resin has been found to be radioactive. This should not change appreciably with the EPU. The remainder of the wet waste is primary resins, filters, and oil and sludge from various contaminated systems. The EPU will not involve changes in either reactor water cleanup flow rates or filter performance. Therefore, the NRC staff concludes that implementation of the proposed EPU will not have a significant impact on the volume or activity of wet radioactive solid waste at ANO–2.

Dry Waste: Entergy states that it continually tracks the volume of dry radioactive waste generated and continually looks for new ways to minimize the volume of waste generated. Dry waste consists primarily of air filters, contaminated paper products and rags, 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, packaged, and removed to a controlled 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 for volume reduction or a burial ground for final disposal.

The licensee has stated that the majority of waste generated at ANO is compactible dry active waste. In light of Entergy's continuing efforts to reduce radioactive wastes at ANO, any projected increase in solid waste generation under the EPU conditions described above would not be significant and is not sufficient to reverse the continuing downward trend in the production and activity of dry wastes. Moreover, due to the nature of the materials in this waste stream, it is not expected to change significantly as a result of the EPU.

Irradiated Reactor Components: Irradiated reactor components such as in-core detectors and fuel assemblies, must be disposed of after the life of the component. The volume and activity of waste generated from spent control element assemblies and in-core detectors may increase slightly under the higher flux conditions associated with EPU conditions.

Entergy plans to load 80 fresh fuel bundles in the initial refueling of ANO–2 to commence operation under the proposed EPU. This is 12 fresh bundles more than required for the current refueling cycle. The number of irradiated fuel assemblies discharged from the reactor should not increase during subsequent reloads for

[1] Guides on Design Objectives proposed by the NRC staff on February 20, 1974; considers doses to individuals from all units on site. From ''Concluding Statement of Position of the Regulatory Staff,'' Docket No. RM–50–2, February 20, 1974, pp. 25–30, U.S. Atomic Energy Commission, Washington, D.C.

comparable energy requirements. Accordingly, the NRC staff concludes that implementation of the EPU will not have a significant impact on the volume or activity of the irradiated reactor components at ANO.

Given the information above, NRC staff concludes that the environmental impact due to generation of solid reactor system waste from the proposed EPU is not significant.

Dose Impacts

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

In-plant Radiation

Increasing the rated power at ANO–2 may increase the radiation levels in the reactor coolant system (RCS). However, ongoing physical plant improvements and administrative controls, such as shielding, RCS chemistry, and the plant radiation protection program, compensate for these potential increases. Over the past 7 years, Entergy has continued to decrease the occupational dose to workers at ANO–2. In years with refueling outages, the total dose decreased by 55 percent from 175 rem in 1995 to 79 rem in 1999. As a result of the length and scope of the steam generator replacement outage in 2000, doses were higher than in a typical year. Non-outage year doses at ANO–2 illustrate a downward trend from 49 rem in 1996 to 35 rem in 1998 to 9 rem in 2001. The licensee stated that it expects to continue this trend while operating under the EPU conditions.

The plant radiation protection program will maintain individual doses consistent with as-low-as reasonably achievable (ALARA) requirements and well below the established limits of 10 CFR Part 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 monitored and controlled under the radiation protection program. Administrative limits are provided for occupational dose at levels well below the 10 CFR Part 20 limits.

These administrative limits provide a significant margin to regulatory dose limits under normal operating and outage conditions. Administrative dose limits at ANO–2 have not been routinely exceeded under present power conditions.

Offsite Doses

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

The ANO–2 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 6.92E–04 millirads for noble gas gamma air, 2.15E–03 millirads for noble gas beta air, and 1.56E–02 millirem to the thyroid for particulates and iodine. Appendix I limits are 10 millirads, 20 millirads, and 15 millirem to the thyroid, respectively. The licensee stated that the offsite dose will continue to be within the technical specification dose limits.

The EPU will not involve significant increases in an offsite dose from noble gases, airborne particulates, iodine, or tritium. Radioactive liquid effluents are not routinely discharged from ANO–2. In addition, as stated by the Radiological Environmental Monitoring Program for ANO–2, radiation exposure from shine dose is not now a significant exposure pathway, and it will not be significantly affected by the EPU.

Therefore, the NRC 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 NRC staff reviewed the licensee's analyses and performed confirmatory calculations to verfy the acceptability of the licensee's calculated doses under accident conditions. Based on these calculations, 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 ANO–2 under accident conditions. If the license amendment request is approved, the result of the staff's analyses will be presented in the safety evaluation issued with the license amendment.

Severe Accidents: The environmental effects of severe accidents outside the design basis of protection and engineered safety systems were not evaluated in the ANO–2 ER. The NRC staff finds that the EPU will not significantly increase the probability or consequences of accidents and will not result in a significant increase in the radiological environmental impact of ANO–2 under accident conditions.

Fuel Cycle and Transportation Impacts

The EPU will 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 10 CFR Part 51, Tables S–3 and S–4, specifically at 10 CFR 51.51 and 10 CFR 51.52, respectively. ANO–2 FES Section 5.5.3 discusses the uranium fuel cycle and transportation impact of the fuel at original issuance of the operating license. An NRC assessment (53 FR 30355, dated August 11, 1988, as corrected by 53 FR 32322, dated August 24, 1988) evaluated the applicability of Tables S–3 and S–4 to higher burnup cycles. The assessment concluded that there is no significant change in environmental impacts for fuel cycles with uranium enrichments up to 5.0 weight-percent U–235 and burnups up to 60 gigawatt-days per metric ton of uranium (GWd/MTU) from the parameters evaluated in Tables S–3 and S–4. In Operating License Amendment 178 dated January 14, 1997, the NRC granted Entergy's request to increase the fuel enrichment from 4.1 percent to 5.0 percent at ANO–2. The environmental effects of this fuel enrichment increase were considered at that time. Since the fuel enrichment for the EPU will not exceed 5.0 weight-percent U–235, and the rod average discharge exposure will not exceed 60 GWd/MTU, the environmental impacts of the proposed EPU will remain bounded by these conclusions and is not expected to be significant.

Summary

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

TABLE 2.—SUMMARY OF RADIOLOGICAL ENVIRONMENTAL IMPACTS OF POWER UPRATE

Surface Water	No change in radiological impact to surface water.
Groundwater	No change in radiological impact to ground water.
Radiological Waste Stream Impacts	No changes in design or operation of waste streams.
Gaseous Radioactive Waste Impacts	An increase in release rate that is linearly proportional to the power increase will be expected.
Liquid Radioactive Waste Impacts	No change in ANO–2 liquid release policy.
Solid Radioactive Waste Impacts:	
Wet Waste	No appreciable change in radioactive secondary resins expected due to EPU.
Dry Waste	No significant changes in dry waste foreseen.
Irradiated Reactor Components	No significant changes in irradiated components forseen.
Dose Impacts:	
In-plant Radiation	Even though some RCS activity levels are elevated, in-plant exposures are controlled to mitigate worker exposures.
Offsite Doses	Slight increase in gaseous activity levels possible, but doses will remain ALARA and within 10 CFR Part 20 limits.
Accident Analysis Impacts	No increase in the probability of an accident. Some increase in consequences of an accident, but still within NRC acceptance limits.
Fuel Cycle and Transportation Impacts	Increase in bundle average enrichment; impacts will 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 NRC 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.

The estimated cost of the increase in 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 with the attendant environmental impacts of construction and operation. The licensee concluded that increasing ANO–2 capacity would be an economical and environmentally sound option for increasing power supply. Furthermore, unlike fossil fuel plants, ANO–2 does not routinely emit sulfur oxides, nitrogen oxides, particulate, matter 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 ANO–2, dated June 1977 (NUREG–0254).

Agencies and Persons Consulted

In accordance with its stated policy, on April 15, 2002, the NRC staff consulted with Division of Radiation Control and Emergency Management of the Arkansas Department of 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 following: The environmental impacts of ANO–2 have been described in (1) the FES, dated June 1977 (NUREG–0254), (2) the PULR, which is Enclosure 5 to the EPU application dated December 19, 2000, and (3) the June 26 and December 10, 2001, and January 15, 2002, RAI responses. On January 31, 2000, as supplemented by letters dated June 26, July 31, and September 21, 2000, Entergy submitted its ER supporting the license renewal of ANO–1. The staff Environmental Impact Statement has been issued as NUREG–1437, Supplement 3. Supplement 3 addresses many balance-of-plant site features that are common to ANO–1 and ANO–2. Supplement 3 was cited in Enclosure 5 of the December 19, 2000, license application in instances where site characteristics common to both ANO–1 and ANO–2 are unchanged by the EPU. 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). Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS should contact the NRC Public Document Room Reference staff by telephone at 1–800–397–4209, or 301–415–2737, or by e-mail at *pdr@nrc.gov.*

Dated at Rockville, Maryland, this 19th day of April 2002.

For the Nuclear Regulatory Commission.

William D. Reckley,

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

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NUCLEAR REGULATORY COMMISSION

Notice of Delay in Issuance of the Draft and Final Environmental Impact Statements for the Mixed Oxide Fuel Fabrication Facility

AGENCY: United States Nuclear Regulatory Commission.

ACTION: Notice of change in schedule.

SUMMARY: On March 7, 2001, pursuant to the National Environmental Policy Act (NEPA), the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent (NOI) to Prepare an Environmental Impact Statement (EIS) for a proposed Mixed Oxide (MOX) Fuel Fabrication Facility (66 FR 13794). NRC staff subsequently held scoping meetings, and issued a Scoping Summary Report in connection with preparing the EIS. NRC staff planned to issue a Draft Environmental Impact Statement (DEIS) on February 27, 2002. NRC staff decided this schedule needed to be changed when, in January 2002, the U.S. Department of Energy (DOE) announced its decision to alter its planned hybrid approach for surplus weapons plutonium disposition [65 FR 1608]. The Plutonium Immobilization Plant (PIP) that DOE had planned to build and operate as part of its hybrid