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ENVIRONMENTAL PROTECTION AGENCY 50-313

WASHINGTON, D.C. 20460

December 22, 1972

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U.S. ATOMIC ENERGY COMMISSION
Regulatory Mail Section

Mr. L. Manning Muntzing
Director of Regulation
U.S. Atomic Energy Commission
Washington, D.C. 20545

Dear Mr. Muntzing:

The Environmental Protection Agency has reviewed the draft environmental statement for Arkansas Nuclear One Unit - 1, and our detailed comments are enclosed.

In our judgment the Arkansas Nuclear One Unit - 1 radioactive wastes management systems are capable of discharging wastes which are within the guidelines of the proposed Appendix I to 10 CFR Part 50. However, the proposed discharge of untreated radioactive condensate demineralizer regeneration wastes is not considered to be consistent with the "as low as practicable" philosophy of effluent discharge.

Our review of the water quality impact of the facility indicates that it may not be able to comply, at all times, with the thermal requirement of the applicable standards.

We will be pleased to discuss our comments with you or members of your staff.

Sincerely,

Sheldon Meyers

Sheldon Meyers
Director
Office of Federal Activities

Enclosure

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ENVIRONMENTAL PROTECTION AGENCY

Washington, D.C. 20450

December 1972

ENVIRONMENTAL IMPACT STATEMENT COMMENTS

Arkansas Nuclear One Unit - 1

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INTRODUCTION AND CONCLUSIONS

The Environmental Protection Agency (EPA) has reviewed the draft environmental impact statement concerning Arkansas Nuclear One Unit - 1, prepared by the U.S. Atomic Energy Commission (AEC) and issued on October 25, 1972. Following are our major conclusions.

1. Our principal radiological finding is that discharge of untreated radioactive liquid wastes from regeneration of the condensate demineralizers is not consistent with the "as low as practicable" discharge philosophy. The final statement should discuss methods of providing for treatment of these radioactive liquids.

2. Analysis of available information indicates that there is a substantial possibility that the once-through cooling system of Arkansas Nuclear One Unit - 1 will not enable the facility to comply, at all times, with the thermal requirements of the applicable water quality standards. The final statement should indicate how compliance will be accomplished.

3. The intake structure and canal, as presently designed, is likely to entrain and impinge large numbers of fish and other aquatic species. We recommend, therefore, that the structure be modified to lower the biotic losses to a more acceptable level. The final statement should describe appropriate plant modifications and any other measures adopted to prevent significant adverse impact on the aquatic environment.

RADIOLOGICAL ASPECTS

Radioactive Waste Management

With the possible exception of the release of radioactive liquid wastes from (1) the regeneration of the condensate demineralizers, (2) turbine building drains, and (3) the laundry drains, Arkansas Nuclear One Unit - 1 is capable of maintaining the release of radioactive materials to "as low as practicable" levels.

The internal procedure of discharging untreated radioactive liquids from the regeneration of the condensate demineralizer is not "as low as practicable." Liquid wastes from regeneration of the condensate demineralizers will be contaminated with radioactivity when there is primary-to-secondary leakage in the steam generators. The draft statement indicates that this waste will not be treated prior to discharge to Lake Dardanelle. A significant portion of the radionuclides from this source will be long-lived and, thus, if discharged untreated, will accumulate in the environment. Thus, we strongly encourage the AEC to insure that these radioactive liquids will be treated in the waste treatment system.

Similarly, it may be necessary to provide for the treatment of liquids discharged through the turbine building drains and laundry drains. The liquid in the turbine building drain system may become contaminated with radioactivity if there is leakage of contaminated secondary system water. The turbine building drain waste will be discharged without treatment while laundry wastes will be treated by particulate filtration only. Although these wastes are expected to contain very low concentrations of radioactivity, provisions should be made for treatment of these wastes, should activities be significantly higher than expected. Furthermore, as a minimum these wastes should be sampled prior to their release to the environment.

The draft statement indicates the condenser air ejector exhaust will be monitored, but that there will be no special provisions made for removing radioiodine. Although the draft statement further estimated radioiodine discharges from the air ejector to be minimal, all assumptions utilized by the AEC to estimate the air ejector radioiodine source-term were not presented in the draft statement. Since the air ejector could be a significant pathway for radioiodine discharge from the plant, it is important that the final statement provide the following information so that an independent evaluation of the magnitude of the potential source can be performed: (1) the credit, if any, taken for radioiodine removal from the secondary system by the condensate demineralizer, (2) the secondary system equilibrum inventory of ^{131}I as calculated by the AEC, and (3) the mass of coolant in the secondary coolant system.

According to the draft statement the annual discharge of noble gases to the environment will be 7,100 curies, exclusive of the radioactivity of the nitrogen cover gas. The annual discharge of this nitrogen cover gas, as shown in Table 3.8 of the draft statement, may amount to almost 10,000 curies. The draft statement, further, indicates that only a 12-hour hold-up time will be provided for the cover gas and did not discuss any alternative system that would provide additional hold-up for this cover gases, if needed. The final statement should address the assumptions used to estimate this release and alternative means of processing these gases.

Dose Assessment

Although the gaseous discharge limits for the station are established at the most critical site boundary distance, which is usually interpreted to be at a point on the "exclusion area" boundary, the closest distance to the plant at which the AEC calculates maximum annual doses is 0.65 miles. The area within this radius however, includes a substantial portion of Lake Dardanelle. Because public access is not controlled in the embayment during normal operation of the plant, it is possible for individuals to spend considerable time closer than 0.65 miles from the plant. Thus, dose rates to these individuals could be higher than those the AEC has calculated. The final statement should include details of the means by which the applicant will determine that the dose to such individuals are within the applicable guidelines and regulations.

Transportation and Reactor Accidents

In its review of nuclear power plants, EPA has identified a need for additional information on two types of accidents which could result in radiation exposure to the public: (1) those involving transportation of spent fuel and radioactive wastes and (2) in-plant accidents. Since these accidents are common to all nuclear power plants, the environmental risk for each type of accident is amenable to a general analysis. Although the AEC has done considerable work for a number of years on the safety aspects of such accidents, we believe that a thorough analysis of the probabilities of occurrence and the expected consequences of such accidents would result in a better understanding of the environmental risks than a less-detailed examination of the questions on a case-by-case basis. For this reason we have reached an understanding with the AEC that they will conduct such analyses with EPA participation concurrent with review of impact statements for individual facilities and will make the results available in the near future. We are taking this approach primarily because we believe that any changes in equipment or operating procedures for individual plants required as a result of the investigations could be included without appreciable change in the overall plant design. If major redesign of the plants to include engineering changes were expected or if an immediate public or environmental risk were being taken while these two issues were being resolved, we would, of course, make our concerns known.

The statement concludes "... that the environmental risks due to postulated radiological accidents are exceedingly small." This conclusion is based on the standard accident assumptions and guidance issued by the AEC for light-water-cooled reactors as a proposed amendment to Appendix D of 10 CFR Part 50 on December 1, 1971. EPA commented on this proposed amendment in a letter to the Commission on January 13, 1972. These comments essentially raised the necessity for a detailed discussion of the technical bases of the assumptions involved in determining the various classes of accidents and expected consequences. We believe that the general analysis mentioned above will be adequate to resolve these points and that the AEC will apply the results to all licensed facilities.

NON-RADIOLOGICAL ASPECTS

Thermal Effects

The Arkansas Nuclear One plant will consist of two nuclear reactors--Unit 1 and Unit 2. Condenser cooling for Unit 1 will be accomplished by means of a once-through system with an intake and discharge on a section of the Arkansas River known as Lake Dardanelle. Unit 2 will employ an evaporative natural-draft tower within a closed-cycle cooling system with makeup water drawn from the same body of water. According to the applicant, the cooling water discharge from Unit 1 operating at full power will consist of 766,000 gpm at a temperature rise of 15°F. This outflow will discharge initially into an 80-acre embayment of Lake Dardanelle and then to the lake.

The resulting temperature of the embayment is expected to exceed 100°F in midsummer. Such a temperature will violate applicable water quality standards. Heated embayment water, on entering Lake Dardanelle is expected to raise the lake surface temperature in excess of 5°F above ambient over the entire width of the lake. Under Arkansas water quality standards, however, as interpreted by the Arkansas Pollution Control Commission, water temperature is considered to be the average of the temperatures measured at 20 percent of the depth below the surface and a similar distance above the bottom. This average temperature must not, however, exceed ambient plus 5°F. We join in the AEC conclusion that the applicant, under these conditions, would not be in compliance with thermal standards under January and July river-flow conditions.

We wish to point out that the 85°F which is used as a baseline summer temperature for predicting surface and average isotherms on Lake Dardanelle is an average figure. There should be some discussion in the final statement of the model estimates of the effects of maximum temperature conditions.

The intake is located downstream from the discharge. Under certain conditions there is a possibility of the recirculation of heated effluent. If such conditions prevail, the rise in cooling water temperature will be greater than 15°F above ambient. The final statement should discuss this aspect.

In view of the likelihood of violations of existing stream standards, it is recommended that the applicant make remedial changes in plant construction and/or operation and discuss such actions in the final statement.

The applicant should be aware that the 1972 Amendments to the Federal Water Pollution Control Act (Public Law 92-500) define the thermal component of any discharge as being a pollutant. EPA is required by this law to set effluent guidelines for pollutants discharged from steam electric power plants by the fall of 1973. Effluent discharges from the Arkansas Nuclear One Unit 1 will have to be in accordance with the requirements of Public Law 92-500.

Unit 2 will contribute approximately 2000 gpm of blowdown water. This will contribute a 0.2°F rise of the combined cooling water discharge. We have not made any judgement as to the cumulative effects of the two plants.

<u>Biological Effects</u>

The high intake velocities of 1.5 feet per second (fps) at the intake canal and 2 to 2.2 fps at the trash screens are likely to cause severe entrainment and impingement of fish and other organisms. Some important fish species in the area whose swimming velocities are less than or equal to these intake velocities are:

o channel bass under four inches long--slightly over 1 fps max.,
o channel bass five to seven inches long--1.5 to over 2 fps.
o crappie six to seven inches long--more than 0.8 fps.,
o small largemouth bass two to four inches long--1 to 1.8 fps.

The staff at the Oak Ridge National Laboratory, as a result of their review of intake velocity in relation to fish loss, indicates that at 1 fps and above there is a significant mortality of aquatic life, especially fish. They recommend a velocity ranging from 0.5 to 0.8 fps.

In addition to the loss of the organisms that impinge on the trash screens, those organisms that pass through the cooling system are expected to incur a 100 percent mortality. This loss may be compounded during low flows when the cooling water intake flow will be approximately 50 percent of the river flow.

We concur with AEC that the applicant should consider the placement of an air-bubble system across the mouth of the intake canal. In addition, we suggest that the applicant consider some or all of the following:

o installation of an electric probe system at the canal entrance,

- o the possibility of widening the canal and intake structure, and/or
- o the installation of a horizontally moving screen and sluice return to ambient water to be placed at an appropriate location in the intake canal.

The thermal plume is expected to overlay the water of Lake Dardanelle to a depth of approximately six feet. In most cases the plume will extend the entire width of the lake. Maximum plume temperatures (July) are expected to range from 96°F at the embayment outlet to 91°F on the opposite shore of the lake. We agree with AEC that such temperatures will enhance the growth of less desirable organisms, reduce species diversity, and reduce or eliminate recreational use of the portions of the lake thus affected.

A blockage of the zone of passage may occur during periods of low flow. Many fish feed and spawn in shallow, shoreline areas. Passage in these areas will be reduced or eliminated since the heated effluent will extend essentially from bank to bank in the upper six foot layer. Also, due to the warm-water overflow, mixing between upper and lower layers will be reduced thus minimizing oxygen replacement in the bottom layer.

Oxygen will be further reduced by the biological oxygen demand of organic wastes already present in the lower layer or received from the warm upper layer due to vessel traffic turbulence. While it is true that fish will have a cool water passage through the lower layer, they will not be able to utilize it if the oxygen supply is too low. The National

Technical Advisory Committee (Water Quality Criteria, 1968) recommends a zone of passage in a river of 75 percent of the cross-sectional area and/or volume flow. A contingency plan should be developed describing action to be taken should monitoring indicate a dissolved-oxygen-concentration drop below 5 mg/liter in the lower water levels of the plume area. This should be discussed in detail in the final statement.

In the past, EPA has recommended the water quality criteria published in the National Technical Advisory Committee's report (Water Quality Criteria, 1968). In part, these recommendations are as follows:

Temperature (warm-water biota)

During any month of the year heat should not be added to a stream in excess of the amount that will raise the temperature of the water (at the expected minimum daily flow for that month) more than 5°F. In lakes, the temperature of the epilimnion in those areas where important organisms are most likely to be adversely affected should not be raised more than 3°F above that which existed before the addition of heat of artificial origin. The increase should be based on the monthly average of the maximum daily temperature.

Dissolved Oxygen

For a diversified warm-water biota, including game fish, DO concentration should be above 5 mg/liter, assuming normal seasonal and daily variations are above this concentration. Under extreme conditions, they may range between 5 and 4 mg/liter for short periods during any 24-hour period, provided that the water quality is favorable in al' other respects.

Chemical Impact on Biota

The projected chemical effluent concentrations of the plant are well under those allowed by the applicable federally-approved chemical water quality standards. There is every indication that these standards will be satisfied.

The draft statement indicates that chlorination of the condenser cooling water will be conducted intermittently for one to two hours each day or as necessary. Concentrations of free residual chlorine in the molecular form, hypochlorous acid, and hypochlorite ions will be limited to a total concentration of 0.5 mg/liter in the effluent stream. Due to the chlorine demand of Arkansas River water of 2 to 4 mg/liter for a contact time of 10 minutes, the applicant believes that free residual chlorine in the discharge will be reduced below 0.01 mg/liter at the outlet to the embayment. No mention, however, is made of combined chlorine in the form of chloramines (almost as toxic as chlorine). An outfall monitoring program should be developed to include provisions for monitoring chlorine in all its forms.

EPA has recommended in the past that concentrations of residual chlorine in receiving waters of 0.1 mg/liter and 0.05 mg/liter should not persist longer than 30 minutes and 2 hours respectively. Should chemical monitoring reveal levels in excess of these limits in the vicinity of the discharge point or biological monitoring indicate that a significant impact on aquatic biota will occur, we would then recommend that the applicant consider adopting an alternate defouling method. For example, the Amertap system or other mechanical cleaning device could be considered. The final statement should discuss such alternatives and the time frame for implementation.

ADDITIONAL COMMENTS

During the review we noted in certain instances that the draft statement does not present sufficient information to substantiate the conclusions presented. We recognize that much of this information is not of major importance in evaluating the environmental impact of the Arkansas Nuclear One Unit - 1. The cumulative effects, however, could be significant. It would, therefore, be helpful in determining the impact of the plant if the pollowing information were included in the final statement:

1. A discussion of the buildup of tritium in the secondary system. Since Unit 1 will not blowdown liquids from the secondary system, tritium will buildup in the secondary system water as a result of the leakge of tritiated water from the primary system. The final statement should include a discussion of (1) the expected concentration of tritium in the secondary system water, (2) the anticipated volume of secondary system water contaminated by tritium, and (3) any plans for the ultimate disposition of this tritiated water.

2. The power rating, in BTU's, of the auxiliary boilers utilized at this facility. The information is necessary since regulations governing the permissible level of emissions for new fossil-fuel-burning facilities (42CFR-466) are based on unit size defined by the rate of heat input.

3. Information on the expected off-site maximum ground level concentration of SO_2, NO_2, and particulates discharged from on-site auxiliary power generators. This information should also include the frequency, duration, and downwind distance of occurrence of this maximum concentration. The final statement should also discuss

whether the emissions of NO_2 and particulates will comply with the 42 CFR 466 concentration limits.

4. A discussion of the measures that will be taken to assure that ozone produced by transmission lines coming from the plant will not have an adverse environmental impact. Reference 62 on page 5-46 of the draft statement indicates that ground level concentrations of ozone theoretically may be as high as 10 to 20 ppb. Ozone concentrations in this range may be significant because they approach the concentration range (30 to 100 ppb) in which sensitive plant species are damaged by ozone.

5. A discussion of the ambient noise levels and noise abatement and control procedures during construction and operation of Units 1 and 2.

6. A discussion of a land disposal system for the detritus and fish collected from the traveling screens. The applicant plans to grind up and discharge back into the outfall all these organic materials collected from the screens. The concept that plankton and other biota kills result in nutrients which in turn contribute to more plankton thus leaving a net difference of neglible proportions, is incorrect. It omits the effect of temperature and nutrient selection of more nutritionally primitive species such as bacteria or blue-green algae.

7. A discussion of the applicant's plans for the currently conducted background survey on thermal, chemical, radiological, and biological aspects of Lake Dardanelle. The applicant states that the survey will continue for about five years after station

operation has begun. We believe that the schedule for curtailing any survey should be based on an analysis of previously collected data rather than a predetermined date set before the plant goes into operation.

8. A discussion of the procedures to be followed for cooling Unit 2 when Unit 1 is shut down. When Unit 1 is shut down, 853 cfs will be pumped through the cooling system in order to dilute the 4 to 100 cfs blowdown of Unit 2. This pumping of dilution water, which would result in the loss of the entrained organisms is not a safisfactory alternative for off-steam blowdown disposal. The small amount of heat from Unit 2 when Unit 1 is inoperable would probably cause less adverse environmental impact than pumping of the additional 853 cfs just to eliminate a heat effect. High chemical concentrations of the blowdown could also be reduced by other means.

9. A discussion of the planned treatment of sanitary wastes. Sanitary wastes for the permanent staff will be processed by septic tanks, sand filter, and chlorine disinfection. Construction worker wastes will be processed through an aerobic biological package plant. All wastes both from permanent and temporary staff should receive aerobic biological treatment and disinfection prior to discharge.

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