NRC FORM 195 (2-76)

U.S. NUCLEAR REGULATORY COMMISSION

DOCKET NUMBER 50-269/270/287

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TO: Mr. Edson G. Case

FROM: Duke Power Company
Charlotte, NC
William O. Parker

DATE OF DOCUMENT 8/4/77

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ENCLOSURE
Providing clarification of the method of handling the low level radioactive resins at Units 1,2 & 3.

ACKNOWLEDGED

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PLANT NAME:
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FOR ACTION/INFORMATION

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DUKE POWER COMPANY
POWER BUILDING
422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

August 4, 1977

TELEPHONE: AREA 704
373-4083

Mr. Edson G. Case, Acting Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

My letter dated December 2, 1976 addressed a study which Duke Power Company had performed concerning the disposal of low level radioactive resins from the secondary polishing demineralizers (the powdex system) to the wastewater collection basins. It was requested that ultimate disposal of the material be permitted pursuant to 10CFR20.302, by burial at such time as the wastewater collection basins are no longer of use.

The purpose of this letter is to provide clarification of the method of handling the low level radioactive resins at Oconee Nuclear Station. The assumptions utilized in establishing an activity limit for the wastewater collection basins as well as the method of operation of the powdex system are described in the attachment to this letter.

The ultimate disposal of this material will be addressed at a later date. In the interim, the inventory of radioactive material will be maintained on Duke Power Company property. Therefore, the request for ultimate disposal pursuant to 10CFR20.302 is hereby rescinded.

Very truly yours,

William O. Parker, Jr.

MST:ge

Attachment

ATTACHMENT 1

Wastewater Collection Basin Inventory Limits

The Oconee Nuclear Station chemical waste system is composed of three basins. Two of these are designated wastewater collection basins and can be operated in a manner analogous to closed tanks, i.e., filled, drained or isolated, in order to control chemical effluents. The third basin is an oil collection basin which cannot be controlled. The Oconee powdex resins are normally discharged to one of the wastewater collection basins to permit the resin to settle out. This study was performed to establish acceptable inventory limits for radioisotopes in the wastewater collection basins in order to permit the discharge of low level radioactive resins to the basins. Considerations in establishing the inventory limits are potential off-site doses resulting from routine releases from the basins and from simultaneous release of all activity in the basins.

For routine releases from the basin, the objective is to limit the potential dose contribution from this source to 10% of the station's 10CFR50 Appendix I guidelines, i.e., 0.9 mrem whole body/yr.-site and 3.0 mrem organ/yr.-site. In establishing inventory limits to meet these criteria, the following assumptions were employed:

1. All radioactivity released to the wastewater collection basin is available to be released to the Keowee River.
2. The dose receptor annually obtains all water from the Clemson water intake.
3. The dose receptor annually obtains all fish from the Keowee River at the site boundary.
4. Mixing ratio at the site boundary is 6.69×10^{-5}.
5. Mixing ratio at the Clemson water intake is 1.83×10^{-5},
6. Continuous discharge of radioactive mixture to the wastewater collection basin is (7 backwashs/mo/unit)(22,000 gal/backwash)/(525600 min/year)= 10.55 gpm.

The dose model described in Regulatory Guide 1.109 was used in this calculation. The equation

$$D = \frac{(1100)\ (Q)\ (DCF)}{F} \left[(M_1)\ (BA)\ (U_f)\ e^{-\lambda t_f} + (M_2)\ (U_w) d^{-\lambda t_c} \right]$$

Where D = annual dose, mrem/yr

Q = radioactive release from pond, Ci/yr

DCF = dose conversion factor, mrem/pCi ingested

F = discharge flowrate to pond, ft^3/sec

M_1 = mixing ratio at site boundary

BA = bioaccumulation factor for freshwater fish, $\frac{pCi/kg}{pCi/l}$

U_f = fish consumption, kg/yr

M_2 = mixing ratio at Clemson water intake

U_w = water consumption, l/yr

1100 = conversion factor, pCi-yr ft^3/Ci-l-sec

λ = decay constant, yr^{-1}

t_f = decay time to fish ingestion, yr

t_c = decay time to water ingestion through Clemson water intake, yr

was used in solving for the limiting release rate for each isotope to assure that the guideline 10% of 10CFR50, Appendix I is not exceeded.

In consideration of the situation in which all activity in the basins is released, the objective to be met in establishing the inventory limit is the 10CFR20 Appendix B concentrations. The assumptions employed in this analysis were:

1. A wastewater collection basin dam fails followed by the failure of the oil collection basin dam.

2. All radioactivity in the waste water collection basin is released to the river through a hydrological dispersion coefficient of 2.05 E-2 (gpm)$^{-1}$

There are three postulated accidents: (1) either one of the wastewater collection basins' dam breaks, all water flows to oil collection pond where it is held; (2) oil collection pond dam breaks, all water flows to the river; and (3) wastewater collection basin dam breaks followed by collection pond dam break, all water flows to river. In all cases, a dam "break" is considered to be the instantaneous removal of a 50 ft. section of the dam. In case 1, if wastewater collection basin # 1 fails, the flow is 3600 cfs for 50 seconds, while for wastewater collection basin # 2 the flow is 900 cfs for 220 seconds. For this analysis, wastewater collection basin # 2 was used due to its lower dilution factor. The flowrate for case # 2 is 2009 cfs for 160 seconds, while for case # 3 the flowrate would be 7950 cfs for 65 seconds. In all cases, no credit was taken for soil absorption or any intermediate damming. The release consequences were found to be the greatest for accident case # 3. Assumption number 1 results from this analysis.

Using the equation

$$Q = \frac{1.99E + 3}{2.05E - 2} C$$

Where: $1.99E + 3$ = conversion $\frac{ml}{gal} \times \frac{min}{yr} \times \frac{Ci}{\mu Ci}$

$2.05E - 2$ = hydrological dispersion coefficient, gpm^{-1}
Q = Limiting Inventory in pond, Ci
C = 10CFR20 Appendix B, Table II Concentrations, μCi/ml

The activity levels in the wastewater collection basin were calculated to assure that the 10CFR20 criterion is met.

The attached Table 1 is a compilation of the more limiting inventory between the routine and accidental release studies. These limits are to be applied to the two waste water collection basins collectively, and not individually.

If the sum of the ratios of the activity present in the basin for each isotope to its respective isotopic limit is less than 1, it can be stated that the objectives of normal and accidental releases have been satisfied. Therefore it is considered that disposal of these low activity radioactive resins will not affect the health and safety of the public.

Method of Operation

The Oconee Nuclear Station utilizes polishing demineralizers (the powdex system) for the control of impurities which might exist in the secondary water. The combination of ion exchange and filtration afforded by these demineralizers also results in the removal of any radioactive contaminants which could occur due to any primary to secondary system leakage. Since the powdered resins are not checmically regenerated for repeated use they are backwashed off of the filter elements to a sump in the Turbine Building This creates a mixture of up to 20,000 gallons of water and 12 cubic feet of resin to be processed.

Since the Turbine Building powdex sump is not large enought to contain the entire volume of backwashed powdex resin and water, a decision is made, prior to the backwash, to route this mixture to a waste water collection basin or to a storage tank. The procedure utilized to aid in making this decision considers the following information.

a. Conditions of OTSG tube leaks
b. Hotwell activity levels
c. Powdex through put data (individual cell)
d. Cell radiation readings
e. Prior resin activity (individual cell)

Additionally, a preselected powdex cell from each unit is sampled monthly when there is not indication of a primary to secondary leak. After a primary to secondary leak, a cell which had been in service during the leak is backwashed to the holding tank and sampled. The activity measured from this batch and a comparison of throughput and cell radiation readings are used to determine whether or not the backwash from other cells in service or additional cell backwash should be sent to the holding tank. In general, resin is recovered if it would add a significant part of the established limit of activity to the basin. Generally, two or three backwash cycles are diverted to the holding tank after a steam generator leak.

In those instances when the backwash is routed to the holding tank, the resin is allowed to settle to the bottom and then the liquid is sampled and decanted from the tank. The remaining resin and water is transferred to a solid waste cask, analyzed, mixed with ureaformaldehyde, and shipped to a licensed burial facility.

Basin Activity Inventory

A cumulative activity inventory of powdex resins discharged to the wastewater collection basins has been maintained since the first identifiable activity was detected in August, 1975. As each filter element which has been determined to have measurable activity is backwashed to a wastewater collection basin, the total activity of each isotope is added to this cumulative inventory. No credit is taken for activity leaving the basins through effluent pathways. The cumulative inventory is decreased to account for radioactive decay.

In the case of those backwashes which are diverted to the holding tank for settling, the solidified powdex resins and water are accounted for as solid waste shipped offsite. The decanted water is sampled and discharged to the wastewater collection basins; however, this water is not considered as adding to the radioactive solid inventory of the basin. All liquid discharged from the wastewater collection basins having measurable concentrations of radionuclides present per 10CFR20 or the technical specifications is added to the annual releases from Oconee Nuclear Station.

Periodically, as the need is perceived, bottom sampling of the wastewater collection basins is performed to provide confirmation of the calculated inventory; however, accounting for input is considered generally more accurate.

TABLE 1

Proposed Radionuclide Limits
On Waste Water Collection Ponds

Isotope	Limit (Ci)
Cr-51	7.85 (1)
Mn-54	5.15
Fe-59	3.57
Co-57	3.88 (1)*
Co-58	8.74 *
Co-60	2.91 *
Sr-89	2.91 (-1)*
Sr-90	2.91 (-2)*
Sr-91	4.85 *
Zr-95	5.82 *
Zr-97	1.94 *
Nb-95	1.90 (-2)
Nb-97	8.74 (2)*
Mo-99	3.88 *
Ru-103	7.76 *
Te-129m	4.94 (-1)
Te-131m	3.88 (-1)
I-130	2.91 (-1)*
I-131	2.91 (-2)*
I-132	7.76 (-1)*
I-133	9.71 (-2)*
I-135	3.88 (-1)*
Cs-134	4.56 (-2)
Cs-136	7.18 (-2)
Cs-137	9.38 (-2)
BA-140	1.94 *
LA-140	1.94 *
Ce-143	3.88 *
W-187	3.77 (-1)

* Accident Limited

Note - These limits must be applied such that the sum of the ratios of the activity present in the ponds for each isotope to its respective limit must be less than unity.