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TO: Mr. Edson G. Case

FROM: Duke Power Co.
Charlotte, N. C. 28242
William O. Parker, Jr.

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DESCRIPTION

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ENCLOSURE Licensee Nos. DPR-38, 47, and 55 Appl for Amend: tech specs proposed change concerning incorporating limits on the reactor coolant and secondary coolant iodine activities in order to assure that dose rates from postulated accidents would be well below the limits of 10CFR Part 100 ...Notorized09/08/77...

9p

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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

TELEPHONE: AREA 704
373-4083

July 8, 1977

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

Attention: Mr. A. Schwencer, Chief
Operating Reactor Branch 1

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

Dear Sir:

Your letter of May 5, 1977 requested that a technical specification amendment be submitted to incorporate limits on the reactor coolant and secondary coolant iodine activities in order to assure that dose rates from postulated accidents would be well below the limits of 10CFR Part 100. In response to this request, an analysis was performed, using standard and Oconee specific assumptions to establish appropriate limits of the iodine activities which should be applied. These assumptions are discussed in the bases for the proposed specifications.

Pursuant to 10CFR50 §50.90, it is requested that the attached proposed technical specification revision be approved. These specifications will assure that the dose rates from postulated accidents are well below the limits of 10CFR Part 100.

Very truly yours,

s/William O. Parker, Jr.
William O. Parker, Jr.

MST:ge

WILLIAM O. PARKER, JR., being duly sworn, states that he is Vice President of Duke Power Company; that he is authorized on the part of said Company to sign and file with the Nuclear Regulatory Commission this request for amendment of the Oconee Nuclear Station Facility Operating Licenses DPR-38, DPR-47, and DPR-55; and that all statements and matters set forth therein are true and correct to the best of his knowledge.

s/William O. Parker, Jr.
William O. Parker, Jr., Vice President

Subscribed and sworn to before me this 8th day of July, 1977.

s/Vivian B. Robbins
Notary Public
(Notarial Seal)

My Commission Expires:

February 15, 1982

1.8 DOSE EQUIVALENT - I-131

The Dose Equivalent I-131 shall be that concentration of I-131 (μCi/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134 and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites".

1.9 $\overline{E}$ - AVERAGE DISINTEGRATION ENERGY

The $\overline{E}$ Average Disintegration Energy shall be the average (weighted in proportion to the concentration of each radionuclide in the reactor coolant at the time of sampling) of the sum of the average beta and gamma energies per disintegration (in MEV) for isotopes, other than iodines, with half lives greater than 15 minutes, making up at least 95% of the total non-iodine activity in the coolant.

3.1.4 Reactor Coolant System Activity

Specification

3.1.4.1 The specific activity of the reactor coolant system shall not exceed 3.5 μCi/gram dose equivalent I-131 except as provided in Specification 3.1.4.2.

3.1.4.2 If the specific activity of the reactor coolant system is greater than 3.5 μCi/gram but less than 60 μCi/gram dose equivalent I-131, power operation may continue for periods of 96 hours.

3.1.4.3 The specific activity of the Reactor Coolant System shall not exceed 311/$\bar{E}$ μCi/gram.

3.1.4.4 If the conditions of Specifications 3.1.4.2 or 3.1.4.3 are not met, the reactor shallbe in a hot shutdown condition within 6 hours. A reportable occurrence shall be submitted to the Commission pursuant to Specification 6.6.2.1.b and shall contain the following information:

a. Reactor power history starting 48 hours prior to the first sample in which the limit was exceeded.

b. Fuel burnup by core region

c. Cleanup flow history starting 48 hours prior to the first sample in which the limit was exceeded

d. History of degassing operations, if any, starting 48 hours prior to the first sample in which the limit was exceeded

e. The time duration when the specific activity of the reactor coolant exceeded 3.5 μCi/gram dose equivalent I-131 or 311/$\bar{E}$ μCi/gram.

Bases

The limitations on the specific activity of the reactor coolant ensure that the resulting 2 hour doses at the site boundary will not exceed an appropriate fraction of the Part 100 limits following a steam generator tube rupture accident. The steam generator tube rupture was analyzed as a separate accident and in conjunction with a steam line break accident. The analyses considered the effects of the "iodine spike" associated with the accident transient and also considered the compounding effects of a preexisting iodine spike caused by some prior transient.

The following iodine spiking model, empirically developed from operating data, was used to calculate the curies of iodine entering the secondary system after the tube rupture:

$$C_{i+1} = C_i e^{-L(t_{i+1}-t_i)} + C^*(\frac{L^*}{L})(\frac{R}{R^*}) e^{-\lambda t_{i+1}}(1-e^{-L(t_{i+1}-t_i)})$$

where:

C_i = I-131 activity in the reactor coolant at time t_i, μCi/gram

t_i = time after start of accident, min.

L = total removal rate of I-131, min^{-1}

R = release rate of I-131 into the reactor coolant, Ci/min.

λ = radioactive decay constant for I-131, min^{-1}

C^* = steady state I-131 concentration prior to transient=3.5 μCi/gram

L^* = steady state removal rate of I-131 prior to transient = 6.85×10^{-4} min^{-1}

R^* = steady state release rate of I-131 into the reactor coolant, Ci/min

Time After Transient Hours (t_i)	Spiking Factor (R/R^*)
0-1	127
1-2	47
2-3	16
3-4	6
4-5	2.3

For the case of a preexisting iodine spike, the curies of iodine entering the secondary system were based on C_i at the time of the tube rupture (t_i=0) being 60 μCi/gram dose equivalent I-131. An accident must occur in a very small "time window" following a power transient for the iodine concentration to be at 60 μCi/gram since this high concentration exists for only a relatively short period of time following a transient. The primary to secondary leak rate associated with a double-ended steam generator tube rupture accident was conservatively assumed to be a constant 435 gpm (43.6 lbs/sec). All of the noble gas activity and 10% of the iodine activity in the leakage entering the secondary system is assumed to be present in the steam mass release to the environment. Also assumed to be released to the environment is the iodine activity in 173,300 lbs of secondary coolant containing 0.1 μCi/gram of dose equivalent I-131 (the maximum value per Tech Spec 3.13) and the iodine and noble gas activity associated with a primary to secondary leak rate of 1 gpm (the maximum leak rate permitted per Tech Spec 3.1.6).

The site boundary doses were based on the zero to two-hour dispersion factor at the site boundary (1609 m) corresponding to a ground release, i.e., (X/Q), of 1.16×10^{-4} sec/m^3 (per Section 2.3.2 of the FSAR). The dose calculations are consistent with TID-14844, except for the conservative assumption that $\bar{E}$ used to calculate the whole body dose includes both the beta and gamma energy whereas TID-14844, Reg. Guides 1.4, 1.24, 1.25, and 1.77 only consider the gamma energy in calculating the whole body dose. The resulting doses are:

	2 Hour Site Boundary Doses (Rem)	
	Thyroid	Whole Body
Steam Generator Tube Rupture with Iodine Spike	2.8	0.34
Steam Generator Tube Rupture with Steam Line Break and Iodine Spike	14.0	0.86
Steam Generator Tube Rupture with Preexisting Iodine Spike	16.1	0.34
Steam Generator Tube Rupture with Steam Line Break and Preexisting Iodine Spike	46.7	0.86

Power operation for time periods with the reactor coolant's specific activity > 3.5 μCi/gram dose equivalent I-131, but less than 60 μCi/gram dose equivalent I-131, accomodates possible iodine spiking phenomenon which may occur following changes in thermal power. Operation with specific activity levels exceeding 3.5 μCi/gram dose equivalent I-131 but within the 60 μCi/gram dose equivalent I-131 limit is restricted to periods not to exceed 96 hours since these activity levels increase the 2 hour thyroid dose at the site boundary by a factor of 3 to 6 following a postulated steam generator tube rupture.

Reducing T_{avg} to < 530°F prevents the release of activity in the event of a steam generator tube rupture since the saturation pressure of the reactor coolant is below the lift pressure of the atmospheric steam relief valves.

The surveillance requirements provide adequate assurance that excessive specific activity levels in the reactor coolant will be detected in sufficient time to take corrective action. The information reported relative to iodine spiking will help to assess the parameters associated with spiking phenomena. A reduction in frequency of isotopic analyses following power changes may be permissible when justified by the data obtained.

3.13 SECONDARY SYSTEM ACTIVITY

Applicability

Applies to the limiting conditions of secondary system activity for operation of the reactor.

Objective

To limit the maximum secondary system activity.

Specification

3.13.1 The specific activity of the secondary coolant system shall not exceed 0.10 μCi/gram dose equivalent I-131.

3.13.2 If the secondary coolant system specific activity exceeds 0.10 μCi/gram dose equivalent I-131, the reactor shall be placed in a hot shutdown condition within 6 hours and in a cold shutdown condition within the following 30 hours.

Bases

The limitations on secondary system specific activity ensure that the resultant offsite radiation dose will be limited to a small fraction of 10CFR100 limits in the event of a steam line rupture. This dose includes the effects of a coincident 1.0 gpm primary to secondary tube leak in the steam generator of the affected steam line. These values are consistent with the assumptions used in the safety analyses.

TABLE 4.1-3

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency
1. Reactor Coolant	a. Gamma Isotopic Analysis	a. Monthly*
	b. Radiochemical Analysis for Sr 89, 90	b. Monthly*
	C. Tritium	c. Monthly*
	d. Gross Beta or Gross Gamma Activity (1)	d. 5 times/week*
	e. Chemistry (Cl, F and O_2)	e. 5 times/week*
	f. Boron Concentration	f. 2 times/week**
	g. Gross Alpha Activity	g. Monthly*
	h. E Determination (2)	h. Semi-annually*
	i. Isotopic Analysis for I-131	i. 5 times/week*
	j. Isotopic Analysis for Dose Equivalent I-131	j. Once per 14 days*
	k. Isotopic Analysis for Iodine Including I-131, I-133 and I-135	k. See note (3)*
2. Borated Water Storage Tank Water Sample	Boron Concentration	Weekly* and after each makeup
3. Core Flooding Tank	Boron Concentration	Monthly* and after each makeup
4. Spent Fuel Pool Water	Boron Concentration	Monthly*** and after each makeup
5. Secondary Coolant	a. Isotopic Analysis for Dose Equivalent I-131 Concentration	a. Weekly*
6. Concentrated Boric Acid Tank	Boron Concentration	Twice Weekly*

*Not Applicable if reactor is in a cold shutdown condition for a period exceeding the sampling frequency.
**Applicable only when fuel is in the reactor.
***Applicably only when fuel is in wet storage in the spent fuel pool.

TABLE 4.1-3 Cont.

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency	Sensitivity of Waste Analysis in Lab
7. Low Activity Waste Tank, Condensate Test Tank, Condensate Monitoring Tank, Laundry-Hot Shower Tank	a. Gamma Isotopic Analysis including Dissolved Noble Gases	a. Prior to release of each batch	a. Gamma Nuclides $<5\times10^{-7}$ μCi/ml Dissolved Gases $<10^{-5}$ μCi/ml
	b. Radiochemical Analysis Sr 89,90	b. Monthly	b. $<10^{-8}$ μCi/ml
	c. Tritium	c. Monthly	c. $<10^{-5}$ μCi/ml
	d. Gross Alpha Activity	d. Monthly	d. $<10^{-7}$ μCi/ml
8. Waste Gas Decay Tank	a. Gamma Isotopic Analysis	a. Prior to release of each batch	a. $<10^{-4}$ μCi/cc (gases) $<10^{-10}$ μCi/cc (particulates and iodines)
	b. Tritium	b. Prior to release of each batch	b. $<10^{-6}$ μCi/cc
9. Unit Vent Sampling	a. Iodine Spectrum	a. Weekly	a. $<10^{-10}$ μCi/cc
	b. Particulates		
	1) Gamma Isotopic Analysis	1) Weekly Composite	1) $<10^{-10}$ μCi/cc
	2) Gross Alpha Activity	2) Quarterly on a sample of one week duration	2) $<10^{-11}$ μCi/cc
	3) Radiochemical Analysis Sr 89,90	3) Quarterly Composite	3) $<10^{-11}$ μCi/cc

TABLE 4.1-3 Cont.

MINIMUM SAMPLING FREQUENCY

Item	Check	Frequency	Sensitivity of Waste Analysis in Lab
	c. Gases by Gamma Isotopic Analysis	c. Weekly	c. $<10^{-4}$ μCi/cc
10. Keowee Hydro Dam Dilution Flow	Measure Leakage Flow Rate	Annually	
11. Condenser Air Ejector Partition Factor	Measure Iodine Partition Factor in Condenser	One time if and when primary to secondary leaks develop	
12. Reactor Building	a. Gamma Isotopic Analysis	a. Each Purge	a. $<10^{-4}$ μCi/cc (gases) $<10^{-10}$ μCi/cc (particulates and iodines)
	b. Tritium	b. Each Purge	b. $<10^{-6}$ μCi/cc

(1) When radioactivity level is greater than 10 percent of the limits of Specification 3.1.4, the sampling frequency shall be increased to a minimum of once each day.

(2) $\overline{E}$ determination will be started when gross beta or gross gamma activity analysis indicates greater than 10 μCi/ml and will be redetermined for each 10 μCi/ml increase in gross beta or gross gamma activity analysis thereafter.

(3) The isotopic analysis of the reactor coolant for iodine including I-131, I-133, I-134 and I-135 shall be performed once per 4 hours whenever the specific activity exceeds 3.5 μCi/gram dose equivalent I-131 or $311/\overline{E}$ μCi/gram. One sample shall be analyzed between 2 and 6 hours following a thermal power change exceeding 15 percent thermal power in a one hour period.