Consumers Power Company

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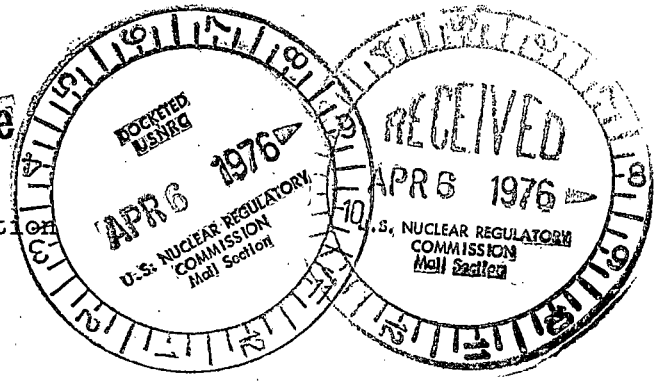

Regulatory Docket File

Director of Nuclear Reactor Regulation
Att: Mr Robert A. Purple, Chief
Operating Reactor Branch No 1
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-255, LICENSE DPR-20 - PALISADES PLANT -
PROPOSED TECHNICAL SPECIFICATIONS, SECONDARY WATER
MONITORING AND MAXIMUM PRIMARY COOLANT RADIOACTIVITY

By letters dated January 30, 1976 and March 9, 1976 we have prepared changes to the Palisades Plant Technical Specifications related to the steam generators.

Following discussions with members of the Commission staff, we have concluded that additional specification changes are appropriate. This letter transmits a new specification on secondary water chemistry and a revised specification on primary coolant radioactivity.

David A. Bixel

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CC: JGKeppler, USNRC

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CONSUMERS POWER COMPANY

Docket No 50-255

Request for Change to the Technical Specifications

License No DPR-20

For the reasons hereinafter set forth, it is requested that the Technical Specifications contained in Provisional Operating License No DPR-20, Docket No 50-255, issued to Consumers Power Company on October 16, 1972, be changed as follows:

I. Changes

A. Add new Section 3.19 as follows:

"3.19 Secondary Water Chemistry Requirements

Applicability:

Applies to the secondary water chemistry of the steam generator blowdown during power operation (generator synchronized).

Objective:

To minimize potential steam generator tube degradation caused by contamination of the secondary coolant.

Specification:

3.19.1 Steam generator water chemistry shall be maintained in accordance with Table 3.19.1 except as specified below.

3.19.2 The limits for pH and sodium specified in Table 3.19.1 shall be achieved within 48 hours of synchronization of the unit. If these limits are not established within this time, the reactor shall be brought to hot standby condition within an additional 24 hours.

3.19.3 During operation, other than that specified in 3.19.2, the limits for pH and sodium may exceed those specified in Table 3.19.1 for a period of up to 24 hours. If these limits are not restored, the reactor shall be placed in hot standby within an additional 24 hours.

"3.19.4 The limit for specific conductivity specified in Table 3.19.1 shall be achieved within 72 hours of synchronization of the unit. If this limit is not established within this time period, then the reactor shall be brought to the hot standby condition within an additional 24 hours.

3.19.5 During operation, other than that specified in 3.19.4, the limit for specific conductivity specified in Table 3.19.1 may be exceeded for a period of up to 24 hours. If these limites are not restored, the reactor shall be placed in hot standby within an additional 24 hours."

TABLE 3.19.1
Secondary Water Chemistry Control Parameters

Sample Point	Specific Conductivity @ 25°C	pH @ 25°C	Sodium
Each Steam Generator Blowdown	7.0 umho/cm	8.0-9.5	0.460 Ppm

Basis

Contamination of the steam generator secondary coolant can cause potential tube degradation and impair tube integrity. Generally, the most severe contamination results from condenser inleakage impurities that may accumulate on the secondary side of the steam generator. Some of these impurities may be caustic forming. High concentrations of free caustic deposited in the steam generator, or on the Inconal -600 tubes, can lead to the potential for intergranular stress corrosion cracking.

Monitoring of the steam generator blowdown total conductivity is an effective means of detecting condenser inleakage. The conductivity of the steam generator blowdown will indicate when increased blowdown is required to remove the accumulation of potentially caustic forming impurities and the scale forming solids in the steam generator. Monitoring the steam generator blowdown sodium concentration will provide adequate insurance that potential caustic forming contaminates in the steam generator are maintained within accepted limits.

"Monitoring the secondary water within the Technical Specifications limits will control the potential accumulation of corrosive impurities in the steam generator and minimize tube degradation."

B. Add new part to Section 4.14 as follows:

"4.14.4 Secondary water chemistry parameters shall be determined to be within the limits of Table 3.19.1 during power operation. Analysis shall be conducted in accordance with the following schedule.

1. Daily for pH and specific conductivity.
2. Three times per week for sodium."

C. Change Section 3.1.4 in its entirety to read as follows:

"3.1.4 Maximum Primary Coolant Radioactivity Specification:

3.1.4.1 Except as specified below the specific activity of iodine isotopes in the primary coolant shall be limited to $\leq$ 4.3 µCi/gram 'dose equivalent I-131.' '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.'

3.1.4.2 With the specific activity of the primary coolant $\leq$ 4.3 µCi/gram 'dose equivalent I-131' but less than 86 µCi/gram 'dose equivalent I-131' operation may continue for up to 72 hours provided that operation under these circumstances shall not exceed 36 days per calendar year.

3.1.4.3 With the specific activity of the primary coolant > 4.3 µCi/gram 'dose equivalent I-131' for more than 72 hours during one continuous time interval or exceeding 86 µCi/gram 'dose equivalent I-131,' an appropriate power reduction shall be made or be in hot standby within 8 hours.

"3.1.4.4 With the specific activity of the primary coolant > 4.3 μCi/gram 'dose equivalent I-131' perform the sampling and analysis requirements of Item 1.3.a of Table 4.2.1 until the specific activity of the primary coolant is restored to within its limits. A reportable occurrence shall be prepared and submitted to the Commission pursuant to Specification 6.9.2.b. This report shall contain the results of the specific activity analysis together with the following information:

1. Reactor power history starting 48 hours prior to the first sample in which the limit was exceeded,
2. Fuel burnup by core region,
3. Clean-up flow history starting 48 hours prior to the first sample in which the limit was exceeded,
4. History of degassing operation, if any, starting 48 hours prior to the first sample in which the limit was exceeded, and
5. The time duration when the specific activity of the primary coolant exceeded 4.3 μCi/gram 'dose equivalent I-131.'

Basis

The maximum specified primary coolant radioactivity is intended to be that which would result from operation with 0.68% fuel defects.(1) Radiation shielding and the radioactive waste disposal systems were designed to operate with 1% defects(2) and, therefore, with the specified maximum radioactivity, these considerations are not limiting. The specified limit provides protection to the public against the potential release of primary coolant radioactivity to the atmosphere as demonstrated by the following analysis of a steam generator tube rupture accident.(3)

References

1. FSAR, Table 11-1.
2. FSAR, Section 11.1.1.
3. FSAR, Section 14.15.

"The maximum potential dose at the site boundary due to this accident, based upon an upper limit calculation, is larger and hence more limiting than the dose that would result from one year of operation with the maximum unidentified leakage from the primary coolant system allowable by Specification 3.1.5.a.

Rupture of a steam generator tube would cause a reactor and turbine trip and allow primary coolant radioactivity to enter the secondary system. Calculations indicate that about 9.5% of the total coolant activity at 1% failed fuel is I-131.(1)

For purposes of the accident dose calculation, however, it is conservatively assumed that 10% of the iodines are released from that portion of the primary coolant leaking into the secondary system. Radioactivity would be released until the operator could reduce the primary coolant system pressure below the set point of the secondary system relief valves and could isolate the faulty steam generator. The accident is considered to be a double-ended break of a single steam generator tube followed by initiation of system cooldown within 30 minutes after the tube break and complete isolation of both steam generators within 3.6 hours. During this period, approximately one-third of the total primary coolant and its associated radioactivity is released to the secondary system.(3)

The limiting dose for this case would be due to the iodine because of its low MPC in air, for which the inhalation dose at the site boundary is computed as follows:

$$\text{Dose (Rem)} = C \cdot V \cdot B(t) \cdot X/Q \cdot DCF \cdot 10^{-1}$$

Where C = Primary coolant "dose equivalent I-131" activity (4.3 μCi/gram).

V = Primary coolant volume released ($1/3 \times 310\ m^3 = 103\ m^3$).

B(t) = Breathing rate ($3.47 \times 10^{-4}\ m^3/s$).

X/Q = $2.6 \times 10^{-4}\ s/m^3$, 0-2 hour dispersion coefficient at site boundary (677 m) using a building wake coefficient of 1/2.

References

Ibid.

"DCF = 1.48 x 10^{6} Rem/Ci I-131 inhaled.

10^{-1} = Fraction of iodine released to atmosphere.

The 4.3 μCi/gram of 'dose equivalent I-131' activity results in less than 6.0 Rem thyroid dose at the site boundary.

The limitations on the specific activity of the primary coolant ensure that the resulting 2-hour doses at the site boundary will not exceed an appropriately small fraction of Part 100 limits following a steam generator tube rupture accident.

The statement permitting power operation to continue for limited time periods with the primary coolant's specific activity 4.3 μCi/gram 'dose equivalent I-131,' but less than 86 μCi/gram 'dose equivalent I-131,' accommodates possible iodine spiking phenomenon which may occur following changes in thermal power. Operation with specific activity levels exceeding 4.3 μCi/gram 'dose equivalent I-131' but less than 86 μCi/gram 'dose equivalent I-131' must be restricted to no more than 10 percent of the unit's yearly operating time since these activity levels could increase the 2-hour thyroid dose at the site boundary by a factor of up to 20 following a postulated steam generator tube rupture.

The 525°F temperature in the specification corresponds to a saturation pressure of 848 psia which is below the 985 psig minimum set point of the secondary system relief valves. Therefore, potential primary to secondary leakage at temperatures below 525°F could be contained within the steam generator by closing the steam line isolation valve on the defective steam generator.

The surveillance requirements provide adequate assurance that excessive specific activity levels in the primary coolant will be detected in sufficient time to take corrective action. Information obtained on iodine spiking will be used to assess the parameters associated with spiking phenomena. A reduction in frequency of isotopic analyses following power changes may be permissible if justified by the data obtained."

D. Change Table 4.2.1 as follows:

1. Change heading to read: "Table 4.2.1 Cont."
2. Delete Item 1 and footnotes (1) and (2) from Page 4-14.
3. Add new Page 4.13b (Table 4.2.1) as follows:

TABLE 4.2.1

MINIMUM FREQUENCY OF SAMPLING TESTS

Test	Frequency	Modes in Which Sample And Analysis Required	FSAR Section Reference
1.0 PRIMARY COOLANT SAMPLES			
1.1 Gross Activity Determination	3 times per 7 days with a maximum time of 72 hours between samples.	T_{avg} greater than 525°F.	None
1.2 Isotopic Analysis for Dose Equivalent I-131 Concentration	1 per 14 days.	Power operation.	None
1.3 Isotopic Analysis for Iodine Including I-131, I-133 and I-135	a) Once per 4 hours, whenever the dose equivalent I-131 exceeds 4.3 µCi/gram, and	(1)	None
	b) One sample between 2 and 6 hours following a thermal power change exceeding 15% of the rated thermal power within a 1-hour period.	T_{avg} greater than 525°F and at thermal power levels above 25% rated power.	None
1.4 Chemistry (Cl and O_2)	3 times/week.	Average primary coolant temperature greater than 210°F.	None
1.5 Chemistry (Fluoride)	Monthly.	Average primary coolant temperature greater than 210°F.	None

(1) Until the specific activity of the primary coolant system is restored within its limits.

E. Change the basis of Section 4.2 by replacing the second paragraph "The radiochemical...turnover rate" with the following:

"The 'dose equivalent I-131' activity of the primary coolant shall be determined to be within the limits by performance of the sampling and analysis program of Table 4.2.1. The analysis for 'dose equivalent I-131' will also provide an adequate method of conservatively estimating the whole body dose which could result from the rupture of a steam generator tube."

II. Discussion

A & B. During an evaluation made to determine the most appropriate limits for detecting the presence of condenser water leakage, condensate conductivity was considered. This review determined that steam generator total conductivity would provide leak detection sensitivity at less than one gallon per minute and that condensate conductivity would not. This difference is due to the concentrating effect of the steam generators. We have thus concluded that measurement of steam generator blowdown conductivity is the most appropriate approach to detecting condenser leakage.

Measurement of free hydroxide was also considered and we have concluded that the most appropriate method of limiting this parameter is by placing a limit on sodium. This limit is equivalent to a free hydrodie limit of 1.0 ppm.

The limits proposed are considered appropriate for the Technical Specifications as limiting condition of operation while continuing to allow for some operational flexibility. Plant operating procedures are much more comprehensive and conservative than those proposed as limiting conditions of operation. This method of control will enhance successful long-term operation without unduly restricting plant operation.

C, D & E. The previously used limit of $75/\overline{E}$ results in a total body dose of 0.5 Rem as follows:

Dose (Rem) = $1/2\ [\overline{E} \cdot A \cdot V/3 \cdot X/Q \cdot (3.7 \times 10^{10}) \cdot (1.33 \times 10^{-11})]$

Where: E = Average energy of betas and gammas per disintegration (MeV).

A = Primary coolant activity ($75/\overline{E}$ Ci/m^3 -MeV).

V = Primary coolant volume (310 m^3); V/3 is volume of coolant released.

X/Q = 2.6×10^{-4} s/m^3, 0-2 hour dispersion coefficient of the site boundary (677 m) using an appropriate building wake coefficient.

3.7×10^{10} dps/Ci

1.33×10^{-11} Rem/MeV/m^3

The resulting whole-body dose is 0.5 Rem.

However, since I-131 is about 9.5% of the total coolant activity(1), the total coolant activity would be about 31 µCi/gram when the I-131 level is high enough to give 6 Rem to the thyroid. In order to achieve 0.5 Rem total body dose, $75/\overline{E} = 31$, or $\overline{E} = 2.42$. Since no nuclide mix within the primary coolant is capable of an E as high as 2.42 MeV, iodine dose will be limiting in all instances.

Limiting the dose to 6 Rem to the thyroid is derived by applying 10 CFR 100.11(a)(1) ratio of thyroid to total body maximum permissible dose. This dose is also essentially identical to that implied in the present Technical Specifications.

Tritium measurements have been deleted as there are no requirements for these measurements.

Fluoride contamination of the primary system is not likely to occur from contaminated makeup water, or work associated with the primary system when it is open. Fluoride levels in the makeup source (lake water) are about a factor of 10 below those for chloride and other sources of fluoride appear to be small compared to that for chloride. We conclude that a monthly sampling frequency for fluoride will be adequate.

Reference

(1) FSAR, Table 11-1.

III. Conclusion

Based on the foregoing, the Palisades Plant Review Committee concluded that this change does not involve an unreviewed safety question. Time restraints have not permitted a review by the Safety and Audit Review Board. This review will be conducted and we will advise you should any of these proposed changes be deemed inappropriate.

CONSUMERS POWER COMPANY

By C R Bilby
C. R. Bilby, Vice President

Date: April 5, 1976

Sworn and subscribed to before me this 5th day of April 1976.

Sylvia B Ball
Sylvia B. Ball, Notary Public
Jackson County, Michigan
My commission expires May 18, 1976.