

PROPOSED TECHNICAL SPECIFICATIONS FOR PWR'S

LIMITING CONDITIONS FOR OPERATION

3.9 Radioactive Materials

Applicability: Applies to the controlled release of radioactive liquids and gases from the facility.

Objective: To define the limits and conditions for the controlled release of radioactive effluents to the environs to ensure that these releases are as low as practicable. These releases should not result in radiation exposures in unrestricted areas greater than a few percent of natural background exposures. The instantaneous release rate for all effluent discharges should be within the limits specified in 10 CFR Part 20.

To assure that the releases of radioactive material to unrestricted areas meet the as low as practicable concept, the following objectives apply:

For liquid wastes:

- a. The annual total quantity of radioactive materials in liquid waste, excluding tritium and dissolved gases, should not exceed 5 curies per unit.
- b. The annual average concentration of radioactive materials in liquid waste, prior to dilution in the environment, excluding tritium and dissolved gases, should not exceed  $2 \times 10^{-3}$   $\mu\text{Ci}/\text{ml}$ ;

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c. The annual average concentration of tritium in liquid waste, prior to dilution should not exceed  $5 \times 10^{-6} \mu\text{Ci/ml}$ ;

For gaseous wastes:

The release rate of radioactive isotopes, averaged over a yearly interval, except I-131 and particulate radioisotopes with half lives greater than 8 days, discharged from the station should not exceed:

$$\sum \frac{Q_i}{(MPC)_i} \leq | 1540 \text{ m}^3/\text{sec}$$

where  $Q_i$  is the annual controlled release rate ( $\text{Ci/sec}$ ) of radioisotope  $i$  and  $(MPC)_i$  ( $\mu\text{Ci/cc}$ ) is defined for radioisotope  $i$  in Column 1, Table II of Appendix B to 10 CFR 20.

The release rate of I-131 and other particulate radioisotopes with half lives longer than 8 days, averaged over a yearly interval, discharged from the station, should not exceed:

$$\sum \frac{Q_i}{(MPC)_i} \leq | 9 \text{ m}^3/\text{sec}$$

where  $Q_i$  and  $(MPC)_i$  are as defined above.

Specification:

A. Liquid Effluents

1. The instantaneous gross radioactivity release concentration in liquid effluents from the station shall not exceed the

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values specified in 10 CFR Part 20, Appendix B, for unrestricted areas.

2. The release rate of radioactive liquid effluents, excluding tritium and noble gases, shall not exceed 10 curies per unit during any calendar quarter.
3. The instantaneous concentration of tritium prior to dilution in a natural body of water shall not exceed  $3 \times 10^{-3} \mu\text{Ci/cc}$ .
4. During release of liquid radioactive wastes, the following conditions shall be met.
  - a. The gross activity monitor and recorder on the radwaste effluent line shall be operable.
  - b. The effluent control monitor shall be set to alarm and automatically close the waste discharge valve prior to exceeding the limits specified in 3.9.A.1 above.
  - c. Liquid waste radioactivity and flow rate shall be continuously monitored and recorded during release.
5. The equipment installed in the liquid radioactive waste system shall be maintained and shall be operated to process all liquids prior to their discharge when the activity release rate will exceed 1.25 curies per unit, excluding tritium and dissolved gases during any calendar quarter.

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6. The maximum activity to be contained in one liquid radwaste tank that can be discharged directly to the environs, shall not exceed 10 curies.
7. When the release rate of radioactive effluents, excluding tritium and noble gases, exceed 2.5 curies per unit during any calendar quarter, the licensee shall notify the Director, Directorate of Licensing within 30 days, identifying the causes and describing the proposed program of action to reduce such release rates.

Basis: Liquid radioactive waste release levels to unrestricted areas should be kept "as low as practicable" and are not to exceed the concentration limits specified in 10 CFR Part 20. These levels provide reasonable assurance that the resulting annual exposure to the whole body or any organ of an individual will not exceed 5 millirems per year. At the same time, these specifications permit the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR Part 20. It is

expected that by using this operational flexibility under unusual operating conditions, and exerting every effort to keep levels of radioactive material in liquid wastes as low as practicable, the annual releases will not exceed a small fraction of the annual average concentration limits specified in 10 CFR Part 20.

The design objectives have been developed based on operating experience taking into account a combination of variables including fuel failures, primary system leakage, primary-to-secondary system leakage and the performance of the various waste treatment systems.

Specification 3.9.A.1 requires the licensee to limit the concentration of radioactive materials in liquid effluents from the station to levels specified in 10 CFR Part 20, Appendix B, for unrestricted areas. This specification provides assurance that no member of the general public can be exposed to liquids containing radioactive materials in excess of limits considered permissible under the Commission's Rules and Regulations.

Specification 3.9.A.2 establishes an upper limit for the release of radioactive liquid effluents, excluding tritium and dissolved gases, of 10 curies per unit during any calendar quarter. The intent of this specification is to permit the licensee the flexibility of operation to assure that the public is provided a dependable source of

power under unusual operating conditions which may temporarily result in releases higher than the levels normally achievable when the station and the liquid radwaste equipment are functioning as designed. The licensee has shown that releases of up to 10 curies per unit during any calendar quarter will result in concentrations of radioactive material in liquid effluents at small percentages of the limits specified in 10 CFR Part 20. It is also in compliance with NEPA requirements.

In addition to the limiting conditions for operation listed under Specification 3.9.A.2, the reporting requirements of Specification 3.9.A.8, in addition to the requirements of Section, 6.7, delineate that the licensee shall identify the cause whenever the release rate of radioactive effluents, excluding tritium and noble gases, exceeds 2.5 curies during any calendar quarter and describe the proposed program of action to reduce such release rate. This report must be filed within 30 days following the calendar quarter in which the 2.5 curie release occurred.

Specification 3.9.A.3 restricts the release of tritium in radioactive liquids to the concentration limits specified by 10 CFR Part 20. This release rate is considered as low as practicable on the basis of operating experience at other similar nuclear power plants, considering the use of cooling towers.

Specification 3.9.A.4 requires the monitoring of the steam generator blowdown, which may be a major source of activity released to the environment, to assure operational attention to excessive releases from this source.

Specification 3.9.A.5 requires that suitable equipment to dilute and monitor the releases of radioactive materials in liquid effluents are operating during any period these releases are taking place.

Specification 3.9.A.6 requires that the licensee shall maintain and operate the equipment installed in the radwaste system to reduce the release of radioactive materials in liquid effluents to as low as practicable consistent with the requirements of 10 CFR Part 50.36a. Normal use and maintenance of installed equipment in the liquid radioactive system is expected to result in releases of not more than about 5 curies per year per unit, excluding tritium and dissolved gases during normal operations. In order to keep releases of radioactive materials as low as practicable, the specification requires, as a minimum, operation of equipment whenever the rate of release exceeds 1.25 curies per quarter, excluding tritium and dissolved gases.

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Specification 3.9.A.7 limits the amount of radioactivity that may be inadvertently released to the environment to an amount that will not exceed the design objective.

B. Airborne Effluents

1. The instantaneous release rate of gross activity, except for halogens and particulates with half-lives longer than eight days, shall not exceed:  $\sum \frac{Q_i}{(7.69 \times 10^4) MPCi} \leq 1$   
where  $Q_i$  is the release rate in  $\mu\text{Ci/sec}$  for isotope  $i$ , and  $MPCi$  is the maximum permissible concentration of isotope  $i$  as defined in Appendix B, Table II, Column 1, 10 CFR 20.
2. The release rate of halogens and particulates with half-lives greater than eight days released to the environs as part of airborne effluents, shall not exceed  $0.09 \mu\text{Ci/sec}$ .  
(I-131 equivalent)
3. a. The release rates of gross gaseous activity shall not exceed 16 percent of the values specified in 3.9.B.1 above, when averaged over any calendar quarter.  
  
b. The release rate of halogens and particulates shall not exceed 8% of the value specified in 3.9.B.2 above, when averaged over any calendar quarter.

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4. During release of gaseous wastes, the following conditions shall be met:
  - a. The gross activity monitor, the iodine activity monitor and particulate activity monitor shall be operable.
  - b. Automatic isolation devices capable of limiting gaseous release rates to within the values specified in 3.9.B.1 and 3.9.B.2 above shall be operable.
  - c. The gross and particulate activity of all gaseous wastes released to the environment shall be monitored and recorded. For effluent streams having continuous monitoring capability, the activity and flow rate shall be monitored and recorded.
  
- For effluent streams without continuous monitoring capability, the activity and release volume shall be monitored and recorded.
  
5. Radioactive gaseous wastes collected in the gas decay tanks shall be heldup a minimum of 45 days, except for radioactive gaseous wastes resulting from purge and fill operations associated with refueling and reactor startup.

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6. The containment purge shall be filtered through the high efficiency particulate air filters and charcoal adsorbers.
7. The maximum activity to be contained in one gas decay tank shall not exceed 8800 curies (Equivalent to Xe-133).
8. When the annual projected release rate of radioactive materials in gaseous wastes, averaged over a calendar quarter exceeds twice the annual objectives, the licensee shall notify the Director, Directorate of Licensing within 30 days, identifying the causes and describing the proposed program of action to reduce such release rates.

Basis The specified levels provide reasonable assurance that the resulting annual exposure rate from noble gases at any location at the site boundary will not exceed 10 millirems per year. At the same time these specifications permit the flexibility of operation, compatible with considerations of health and safety, to assure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in releases higher than the design objective levels but still within the concentration limits specified in 10 CFR Part 20. It is expected that using this operational flexibility under unusual operating conditions, and by exerting every effort to keep levels of radioactive material in gaseous wastes as low as practicable, the annual releases will not

exceed a small fraction of the annual average concentration limits specified in 10 CFR Part 20. These efforts should include consideration of meteorological conditions during releases.

The design objectives have been developed taking into account a combination of system variables including fuel failures, primary system leakage, primary to secondary system leakage, steam generator blowdown and the performance of radioisotope removal mechanisms.

The release rate of noble gases stated on the objectives will limit the concentration to less than 2% of 10 CFR Part 20 requirements at the site restricted area boundary (<10 mrem per year). The I-131 and particulate release rate stated in the objectives would limit the concentration at nearby dairy farms to less than 1/70,000 of the 10 CFR Part 20 levels.

The "as low as practicable" gaseous release objectives are based on guidelines that have not been adopted as yet. The release objectives of these specifications will be reviewed at the time Appendix I becomes a regulation to assure that these specifications are based upon the guidelines contained therein.

Specification 3.9.B.1 requires the licensee to limit the concentration of radioactive materials in gaseous effluents from the station

to levels specified in 10 CFR Part 20, Appendix B, for unrestricted areas. This specification provides assurance that no member of the general public can be exposed to limits containing radioactive materials in excess of limits specified in Commission's Rules and Regulations.

Specification 3.9.B.2 requires the licensee to limit the concentration of halogens and particulates with half-lives greater than eight days released from the station to 1/700 of the levels of 10 CFR Part 20, Appendix B for unrestricted areas. This reduction factor of 700 is arbitrarily applied to radionuclides of iodine and to all radionuclides in particulate form with a half-life greater than 8 days to allow for the milk exposure pathway. The release rate is determined by  $\Sigma \frac{Q_i}{MPC_i} \leq \frac{M^3/sec}{700}$  where  $Q_i$  and MPC are defined in 3.9.B.1. The  $x/Q$  value is derived from the annual average meteorological data.

Specification 3.9.B.3 establishes an upper limit for the release of gaseous activity at 16% of instantaneous release limit averaged over any calendar quarter. The intent of this specification is to permit the licensee the flexibility of operation to assure that the public is provided a dependable source of power under unusual operating conditions which may temporarily result in higher releases than the objectives. The licensee has shown

that gaseous releases will result in a small fraction of doses specified in 10 CFR Part 20.

Specification 3.9.B.4 requires that suitable equipment to dilute and monitor the radioactive gaseous releases are operating during any period these releases are taking place.

Specification 3.9.B.5 requires a 45-day holdup time for radioactive gaseous wastes collected in the gas decay tanks to assure decay of most isotopes. The doses at the site boundary after 45 days (mainly from Kr<sup>85</sup>) of holdup are calculated to result in less than 5 mrem/yr.

Specification 3.9.B.6 limits the radioactivity that may be released to the environment to "as low as practicable."

Specification 3.9.B.7 limits the maximum offsite dose to well below the limits of 10 CFR Part 100, postulating that the rupture of a waste gas decay tank holding the maximum activity releases all of the contents to the atmosphere.

In addition to the limiting conditions for operation listed under 3.9.B.1, 3.9.B.2 and 3.9.B.3, the reporting requirements of Specification 3.9.B.8 delineate that the licensee shall identify the cause whenever the radioactive gaseous release rate exceeds twice the annual design objective averaged over a calendar quarter, and

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describe the proposed program of action to reduce such release rate. The report must be filed within 30 days following the calendar quarter in which more than twice the design release rate occurred.

SURVEILLANCE REQUIREMENTS

4.9 Radioactive Materials

Applicability: Applies to the periodic test and record requirements and sampling and monitoring methods used for facilities effluents.

Objective: To ensure that radioactive liquid and gaseous releases from the facility are maintained as low as practicable and within the limits specified by Specifications 3.9.A and 3.9.B.

SPECIFICATION

A. Liquid Effluents

1. Facility records shall be maintained of the radioactive concentrations and volume before dilution of each batch of liquid effluent released, and of the average dilution flow and length of time over which each discharge occurred.

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2. Prior to release of each batch of liquid effluent, a sample shall be taken from that batch and analyzed for the concentration of each significant gamma energy peak to demonstrate compliance with Specification 3.9.A using the circulating water flow rate at time of discharge.
3. Radioactive liquid waste sampling and activity analysis shall be performed in accordance with Table 4.9-1.
4. The liquid effluent radiation monitor shall be calibrated at least quarterly by means of a check source and annually with a known radioactive source. Each monitor, as described, shall also have an instrument channel test monthly and a sensor check daily.
5. The status and performance of automatic isolation valves and discharge tank selection valves and results of independent liquid waste samples shall be checked and logged monthly.

Basis: The surveillance requirements given under Specification 4.9.A provide assurance that liquid wastes are properly controlled and monitored during any planned release of radioactive materials in liquid effluents. These surveillance requirements provide the data for the licensee and the Commission to evaluate the station's

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Table 4.9-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS

A. Test Tank Releases

Sampling Frequency	Type of Activity Analysis	Sensitivity of Analysis
Each Batch	Gross $\beta, \gamma$	$10^{-7}$ $\mu\text{Ci}/\text{ml}$
One Batch/Month	Dissolved Noble Gases	$10^{-5}$ $\mu\text{Ci}/\text{ml}$
Weekly Proportional Composite (1)	Ba-140, La-140, I-131	$10^{-6}$ $\mu\text{Ci}/\text{ml}$
Monthly Proportional Composite (1)	Gamma Emitters H-3	$10^{-6}$ $\mu\text{Ci}/\text{ml}$ (2) $10^{-3}$ $\mu\text{Ci}/\text{ml}$
Quarterly Proportional Composite (1)	Gross $\alpha$ Sr-89, Sr-90	$10^{-7}$ $\mu\text{Ci}/\text{ml}$ $10^{-3}$ $\mu\text{Ci}/\text{ml}$ (3)

B. Secondary Plant Blowdown and Leakage Releases (3)

Sampling Frequency	Type of Activity Analysis	Sensitivity of Analysis (5)
Weekly	Gross $\beta, \gamma$ Ba-140, La-140, I-131	$10^{-7}$ $\mu\text{Ci}/\text{ml}$ $10^{-6}$ $\mu\text{Ci}/\text{ml}$
One Sample/Month	Dissolved Noble Gases	$10^{-4}$ $\mu\text{Ci}/\text{ml}$
Monthly Proportional Composite (4)	Gamma Emitters H-3	$10^{-6}$ $\mu\text{Ci}/\text{ml}$ (2) $10^{-3}$ $\mu\text{Ci}/\text{ml}$
Quarterly Proportional Composite (4)	Gross $\alpha$ Sr-89, Sr-90	$10^{-7}$ $\mu\text{Ci}/\text{ml}$ $10^{-3}$ $\mu\text{Ci}/\text{ml}$ (6)

NOTES:

- (1) A proportional sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged from the plant.

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- (2) For certain mixtures of gamma emitters, it may not be possible to measure radionuclides in concentrations near their sensitivity limits when other nuclides are present in the sample in much greater concentrations. Under these circumstances, it will be more appropriate to calculate the concentrations of such radionuclides using observed ratios with those radionuclides which are measureable.
- (3) Secondary plant blowdown and secondary plant leakage are each subject to the sampling and analysis requirements contained in Part B of Table 4.9-1.
- (4) Since these potential sources of liquid radioactive waste are discharged on a continuous rather than batch basis, the volume of liquid to be used as a basis for obtaining proportional samples from secondary blowdown and leakage is that amount discharged over the period of one week.
- (5) One quarterly proportional composite sample will be collected and analyzed for Sr-89 and Sr-90. The proportional inputs to this sample will be from the test tank, secondary blowdown, and secondary leakage releases.

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performance relative to radioactive liquid wastes released to the environment. Reports on the quantities of radioactive materials released in liquid effluents shall be furnished to the Commission on the basis of Section 6.7 of these Technical Specifications. On the basis of such reports any additional information the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

4.9.B Airborne Effluents

1. Gross radioactivity of gaseous effluents shall be monitored and recorded to enable release rates of gross radioactivity to be determined on an hourly basis.
2. Radioactive gaseous waste sampling and activity analysis shall be performed in accordance with Table 4.9-2.
3. The waste gas holding tank effluent monitor shall be tested prior to any release of radioactive gas from a holdup tank and shall be calibrated at refueling intervals. The calibration procedure shall consist of exposing the detector to a referenced calibration source in a controlled reproducible geometry. The source and geometry shall be referenced to the original monitor calibration which provides the applicable calibration curves.

4. Gases discharged through the stack shall be continuously monitored for gross noble gas and particulate activity. Whenever either of these monitors is inoperable, appropriate grab samples shall be taken and analyzed daily.
5. During power operation, the condenser air ejector discharge shall be continuously monitored for gross radiogas activity. Whenever this monitor is inoperable, grab samples shall be taken and analyzed for gross radioactivity ( $\beta, \gamma$ ) and the ratio of long-lived (greater than 8 days half-life) to short-lived radioactivity determined at least five days per week and whenever the primary coolant gross radioactivity or the unidentified leak rate increases by a factor of 2.
6. When the secondary system iodine concentration is greater than 25 percent of the limit specified in 3.13, samples from the air ejector shall be taken at least weekly. At the same time, a determination of the iodine partition factor for the blowdown tank shall be made.
7. Facility records of iodine and particulate releases with half lives greater than eight days shall be maintained on the basis of all the iodine sampling devices and particulate filter analyses.

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8. Records shall be maintained and reports of the sampling and analysis results shall be submitted in accordance with Sections 6.7 of these Specifications.

Basis: The surveillance requirements given under Specification 4.9.B provide assurance that radioactive gaseous effluents from the station are properly controlled and monitored over the life of the station. These surveillance requirements provide the data for the licensee and the Commission to evaluate the station's performance relative to radioactive gaseous wastes released to the environment. Reports on the quantities of radioactive materials released in gaseous effluents shall be furnished to the Commission on the basis of Section 6.7 of these Technical Specifications. On the basis of such reports and any additional information the Commission may obtain from the licensee or others, the Commission may from time to time require the licensee to take such action as the Commission deems appropriate.

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Table 3.9-2

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS

A. Gas Decay Tank Releases

Sample Type	Sampling Frequency	Type of Activity Analysis	Sensitivity of Analysis (1)
Gas	Each Tank Release	Gross Gamma	$10^{-5}$ $\mu\text{Ci}/\text{cc}$
		Individual Gamma Emitters	$10^{-4}$ $\mu\text{Ci}/\text{cc}$ (2)

B. Containment Venting Releases

Sample Type	Sampling Frequency	Type of Activity Analysis	Sensitivity of Analysis (1)
Gas	Each Vent	Gross Gamma	$10^{-5}$ $\mu\text{Ci}/\text{cc}$
		Individual Gamma Emitters	$10^{-4}$ $\mu\text{Ci}/\text{cc}$ (2)
Dehumidified Sample	Each Vent	H-3	$10^{-6}$ $\mu\text{Ci}/\text{cc}$

C. Condenser Air Ejector Releases

Sample Type	Sampling Frequency	Type of Activity Analysis	Sensitivity of Analysis (1)
Gas	Monthly	Gross Gamma	$10^{-4}$ $\mu\text{Ci}/\text{cc}$
		Individual Gamma Emitters	$10^{-3}$ $\mu\text{Ci}/\text{cc}$ (2)

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Table 3.9-2 (cont'd)

D. Stack Releases

Sample Type	Sampling Frequency	Type of Activity Analysis	Sensitivity of Analysis (1)
Gas	Quarterly	Gross Gamma	$10^{-6}$ $\mu\text{Ci}/\text{cc}$
		Individual Gamma Emitters	$10^{-4}$ $\mu\text{Ci}/\text{cc}$ (2)
Dehumidified Sample	Each Decay Release	H-3	$10^{-9}$ $\mu\text{Ci}/\text{cc}$
Charcoal	Weekly	I-131, I-133, I-135	$1 \times 10^{-10}$ $\mu\text{Ci}/\text{cc}$
Particulates	Weekly	Gross $\beta, \gamma$	$1 \times 10^{-11}$ $\mu\text{Ci}/\text{cc}$
	Weekly	Ba-140, La-140, I-131	$1 \times 10^{-10}$ $\mu\text{Ci}/\text{cc}$
	Monthly Composite Of Weekly Samples	Gross $\beta, \gamma$	$1 \times 10^{-11}$ $\mu\text{Ci}/\text{cc}$
	Quarterly site of Weekly Samples	Individual Gamma Emitters	$1 \times 10^{-10}$ $\mu\text{Ci}/\text{cc}$
	Sr-89, Sr-90	Sr-89, Sr-90	$1 \times 10^{-11}$ $\mu\text{Ci}/\text{cc}$
	One Weekly Sample/Quarter	Gross $\alpha$	$1 \times 10^{-11}$ $\mu\text{Ci}/\text{cc}$

NOTES:

- (1) The above activity analysis sensitivities are based on the projected capability of laboratory instrumentation and techniques. In order to assure that actual operating experience is utilized, a reevaluation will be performed within 2 years of initial full power operation of the plant.
- (2) For certain mixtures of gamma emitters, it may not be possible to measure radionuclides at levels near their sensitivity limits when other nuclides are present in the sample at much higher levels. Under these circumstances, it will be more appropriate to calculate the levels of such radionuclides using observed ratios with those radionuclides which are measurable.

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