TECHNICAL EVALUATION REPORT

RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATION IMPLEMENTATION (A-2)

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

SALEM NUCLEAR GENERATING STATION UNITS 1 AND 2

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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center under a contract with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

1. INTRODUCTION

1.1 PURPOSE OF REVIEW

The purpose of this technical evaluation report (TER) is to review and evaluate the proposed changes in the Technical Specifications of Salem Nuclear Generating Station Units 1 and 2 with regard to Radiological Effluent Technical Specifications (RETS) and the Offsite Dose Calculation Manual (ODCM).

The evaluation uses criteria proposed by the NRC staff in the model technical specifications for pressurized water reactors (PWRs), NUREG-0472 [1]. This effort is directed toward the NRC objective of implementing RETS which comply principally with the regulatory requirements of the Code of Federal Regulations, Title 10, Part 50 (10CFR50), "Domestic Licensing of Production and Utilization Facilities," Appendix I [2]. Other regulations pertinent to the control of effluent releases are also included within the scope of compliance.

1.2 GENERIC BACKGROUND

Since 1970, 10CFR50, Section 50.36a, "Technical Specifications on Effluents from Nuclear Power Reactors," has required licensees to provide technical specifications which ensure that radioactive releases will be kept as low as reasonably achievable (ALARA). In 1975, numerical guidance for the ALARA requirement was issued in 10CFR50, Appendix I. The licensees of all operating reactors were required [3] to submit, no later than June 4, 1976, their proposed ALARA Technical Specifications and information for evaluation in accordance with 10CFR50, Appendix I.

However, in February 1976, the NRC staff recommended that proposals to modify Technical Specifications be deferred until the NRC completed the model RETS. The model RETS deals with radioactive waste management systems and environmental monitoring. Although the model RETS closely parallels 10CFR50, Appendix I requirements, it also includes provisions for addressing other issues.

These other issues are specifically stipulated by the following regulations:

- 10CFR20 [4], "Standards for Protection Against Radiation," Paragraphs 20.105(c), 20.106(g), and 20.405(c) require that nuclear power plants and other licensees comply with 40CFR190 [5], "Environmental Radiation Protection Standards for Nuclear Power Operations," and submit reports to the NRC when the 40CFR190 limits have been or may be exceeded.

- 10CFR50, Appendix A [6], "General Design Criteria for Nuclear Power Plants," contains Criterion 60 - Control of releases of radioactive materials to the environment; Criterion 63 - Monitoring fuel and waste storage; and Criterion 64 - Monitoring radioactivity releases.

- 10CFR50, Appendix B [7], establishes the quality assurance required for nuclear power plants.

The NRC position on the model RETS was established in May 1978 when the NRC's Regulatory Requirements Review Committee approved the model RETS: NUREG-0472 for PWRs [1] and NUREG-0473 [8] for boiling water reactors (BWRs). Copies were sent to licensees in July 1978 with a request to submit proposed site-specific RETS on a staggered schedule over a 6-month period. Licensees responded with requests for clarifications and extensions.

The Atomic Industrial Forum (AIF) formed a task force to comment on the model RETS. NRC staff members first met with the AIF task force on June 17, 1978. The model RETS was subsequently revised to reflect comments from the AIF and others. A principal change was the transfer of much of the material concerning dose calculations from the model RETS to a separate ODCM.

The revised model RETS was sent to licensees on November 15 and 16, 1978 with guidance (NUREG-0133 [9]) for preparation of the RETS and the ODCM and a new schedule for responses, again staggered over a 6-month period.

Four regional seminars on the RETS were conducted by the NRC staff during November and December 1978. Subsequently, Revision 2 of the model RETS and additional guidance on the ODCM and a Process Control Program (PCP) were issued in February 1979 to each utility at individual meetings. In response to the NRC's request, operating reactor licensees have subsequently submitted initial proposals on plant RETS and the ODCM. Review leading to ultimate

implementation of these documents was initiated by the NRC in 1981 using subcontracted independent teams as reviewers.

As the RETS review process has progressed since September 1981, feedback from the licensees has led the NRC to believe that modification to some provisions in the current version of Revision 2 is needed to better clarify specific concerns of the licensees and thus expedite the entire review process. Starting in April 1982, NRC distributed revised versions of RETS in draft form to the licensees during the site visits. The new guidance on these changes was presented in the AIF meeting on May 19, 1982 [10]. Some interim changes regarding the Radiological Environmental Monitoring Section were issued in August 1982 [11]. With the incorporation of these new changes, NRC issued, in September 1982, a draft version of NUREG-0472, Revision 3 [12], to serve as new guidance for the review teams.

1.3 PLANT-SPECIFIC BACKGROUND

In conformance with the 1975 directive [3], Public Service Electric and Gas Company (PSE&G), the Licensee for Salem Nuclear Generating Station Units 1 and 2, submitted information for 10CFR50, Appendix I Evaluation, dated June 4, 1976 [13] and additional information on October 26, 1976 [14] and December 1, 1976 [15].

The RETS and ODCM were addressed in the next submittal by the Licensee, dated November 26, 1979 [16]. The submittal was a response to the November 15-16, 1978 NRC request and followed the format of NUREG-0472 for PWRs. On March 19, 1982, Franklin Research Center (FRC), selected as an independent reviewer, initiated a review and evaluation of the RETS and ODCM submittals. These submittals were compared to the model RETS [1] and to the general provisions for the ODCM [17] which were given to each operating reactor (OR) as guidelines for preparing the RETS and the ODCM. The Licensee's RETS and ODCM submittals were assessed for compliance with the requirements of 10CFR50, Appendix I, and the "General Design Criteria," 10CFR50, Appendix A.

Copies of the draft review reports dated April 16, 1982 [18, 19] were delivered to the NRC and to the Licensee prior to a site visit to the Salem

Nuclear Generating Station in Hancocks Bridge, NJ. The purpose of the site visit was to resolve questions raised in the draft review reports.

The site visit was conducted on June 14-15, 1982. Discussions were held with PSE&G and Salem Station personnel to review the RETS and ODCM reports. Agreement was reached on most items dicussed at the meetings, at which time the Licensee made a commitment to resubmit drafts of the RETS and ODCM by August 15, 1982. A trip report was prepared and delivered to the NRC on August 13, 1982 [20]. The report included the resolutions reached, as well as "open items" to be resolved by the NRC with the Licensee.

On May 10, 1983, revised draft copies [21] of the Licensee's RETS for Salem Unit 2 were received by the FRC review team and the final review was initiated. The formal RETS submittal for Salem Units 1 and 2, dated June 17, 1983 [22], was received by the FRC RETS review team on June 24, 1983 [23]; this review addresses this final submittal. Because Salem Units 1 and 2 are identical plants with similar technical specifications, this technical evaluation report (TER) addresses the evaluation of RETS for both units. The proposed RETS was reviewed and evaluated based on the draft model RETS, NUREG-0472, Revision 3 [12], and comments on the proposed RETS were supplied to the NRC on May 27, 1983 [24]. A revised ODCM was submitted on June 24, 1983 [25]. A process control program has not been submitted with the RETS.

Details of the RETS review are documented in the comparison copy [26].

2. REVIEW CRITERIA

Review criteria for the RETS and ODCM were provided by the NRC in three documents:

NUREG-0472, RETS for PWRs

NUREG-0473, RETS for BWRs

NUREG-0133, Preparation of RETS for Nuclear Power Plants.

Twelve essential criteria are given for the RETS and ODCM:

1. All significant releases of radioactivity shall be controlled and monitored.
2. Offsite concentrations of radioactivity shall not exceed the 10CFR20, Appendix B, Table II limits.
3. Offsite radiation doses shall be ALARA.
4. Equipment shall be maintained and used to keep offsite doses ALARA.
5. Radwaste tank inventories shall be limited so that failures will not cause offsite doses exceeding 10CFR20 limits.
6. Hydrogen and/or oxygen concentrations in the waste gas system shall be controlled to prevent explosive mixtures.
7. Wastes shall be processed to shipping and burial ground criteria under a documented program, subject to quality assurance verification.
8. An environmental monitoring program, including a land-use census, shall be implemented.
9. The radwaste management program shall be subject to regular audits and reviews.
10. Procedures for control of liquid and gaseous effluents shall be maintained and followed.
11. Periodic and special reports on environmental monitoring and on releases shall be submitted.
12. Offsite dose calculations shall be performed using documented and approved methods consistent with NRC methodology.

Subsequent to the publication of NUREG-0472 and NUREG-0473, the NRC staff issued guidelines [27, 28], clarifications [29, 30], and branch positions [31, 32, 33] establishing a policy that requires the licensees of operating reactors to meet the intent, if not the letter, of the model RETS provisions. The NRC branch positions issued since the RETS implementation review began have clarified the model RETS implementation for operating reactors.

Review of the ODCM will be based on the following NRC guidelines: Branch Technical Position, "General Content of the Offsite Dose Calculation Manual" [17]; NUREG-0133 [9]; and Regulatory Guide 1.109 [34]. The ODCM format is left to the Licensee and may be simplified by tables and grid printouts.

3. TECHNICAL EVALUATION

3.1 GENERAL DESCRIPTION OF RADIOLOGICAL EFFLUENT SYSTEMS

This section briefly describes the liquid and gaseous radwaste effluent systems, release paths, and control systems installed at Salem Nuclear Generating Station Units 1 and 2, which are both pressurized water reactors.

3.1.1 Radioactive Liquid Effluent

The liquid radwaste treatment system, which is similar for both Units 1 and 2, has the capability to collect, treat, store, and dispose of most radioactive liquid wastes. The wastes are collected in sumps and drain tanks in the various buildings and are then transferred to the appropriate tanks in the radwaste building for further treatment, temporary storage, and disposal. The processed liquid wastes are either returned to the chemical and volume control system or released to the environment through the discharge canal. Batches of radioactive liquid waste are discharged to the Delaware River if the concentration of radioactive materials is within the allowable limits.

A diagram of the liquid effluent release paths indicating the location of the liquid effluent monitors is shown in Figure 1. The radioactive liquid wastes originating from the primary drains, equipment drains, primary coolant letdown, and chemical wastes are processed through filters and evaporators prior to release. The laundry drains are stored in the waste monitor tanks prior to discharge. These wastes are monitored and controlled by liquid radwaste effluent radiation monitor (R18). The steam generator blowdown waste effluents are monitored by the chemical waste basin line radiation monitor (R37). Potential leakage of radioactive material into the service water effluents is monitored by the containment fan coolers/service water line discharge monitors (R13A, B, C, D, and E). The turbine building floor drain effluents are an insignificant source of radioactive material and therefore are not monitored. As a safety measure, the liquid radwaste effluent radiation monitor (R18) and steam generator blowdown line radiation monitors (R19A, B, C, and D) are provided with automatic termination of release upon a high concentration alarm signal.

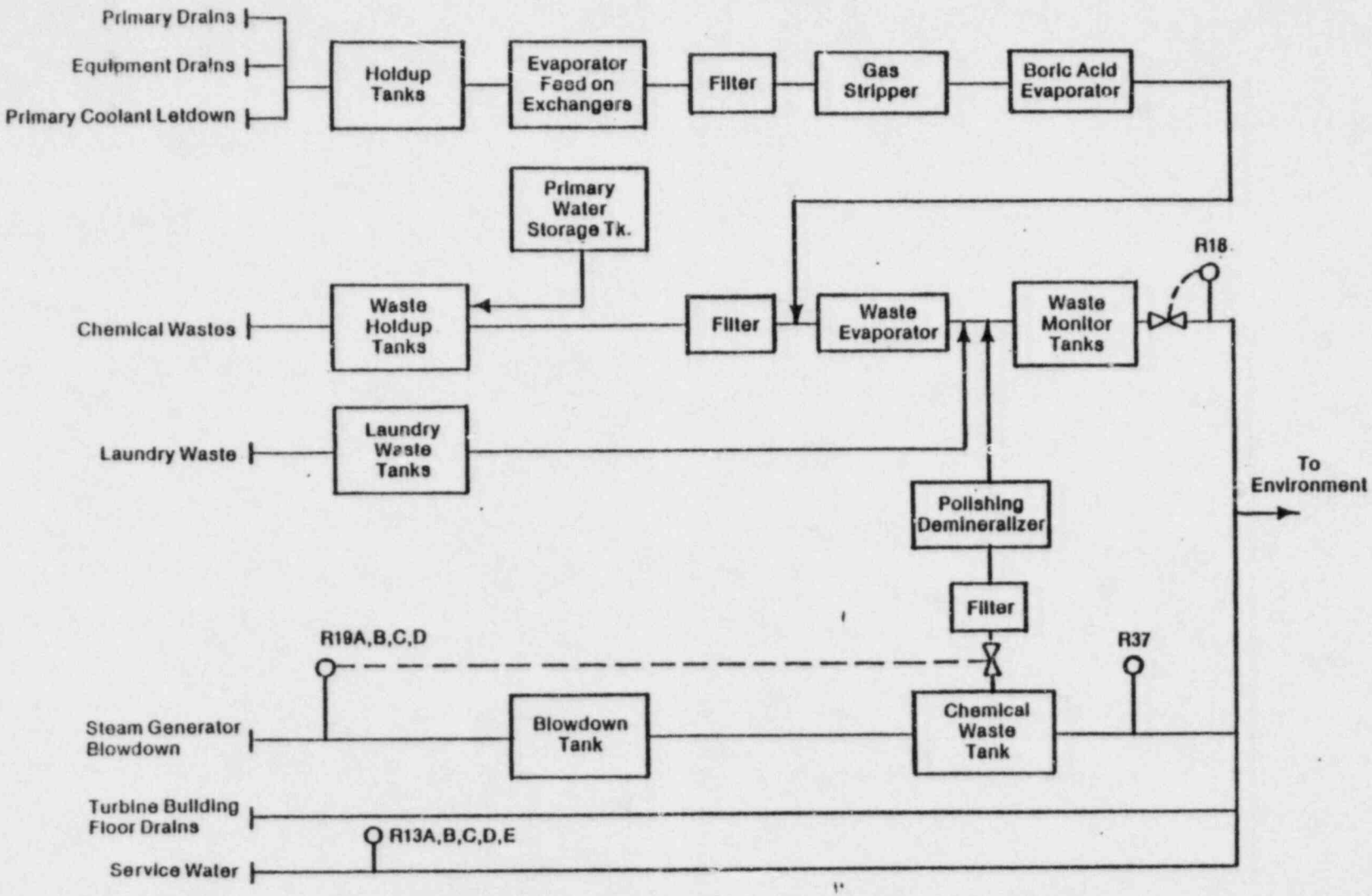

Figure 1. Liquid Radwaste Treatment Systems, Effluent Paths, and Controls for Salem Nuclear Generating Station Units 1 and 2

3.1.2 Radioactive Gaseous Effluent

Airborne particulates and gases vented from process equipment and building ventilation exhaust air are the normal sources of radioactive gaseous effluents from the Salem site. The major source from each unit is the waste gas holdup system, which contains four waste decay tanks to ensure that releases are ALARA.

A diagram showing the location of radioactive gaseous effluent monitors is shown in Figure 2. Wastes originating from the following sources are discharged through the plant vent stack: main condenser/air ejector, containment purge, process gas, and the ventilation exhaust from the fuel handling building, radwaste area, and the auxiliary building. The plant vent stack releases are monitored by a noble gas monitor (R41C or R16), a particulate sampler (R41A), and an iodine sampler (R41B). Noble gas monitor R41C provides alarm and automatic termination of release for effluents from the waste gas holdup system. The waste gas holdup system is equipped with an oxygen monitor to prevent the possibility of explosive gas mixture concentrations in the waste gas decay tanks. Ventilation releases from the auxiliary building, containment purge, and the fuel handling building are processed by HEPA filters and charcoal filters as shown in Figure 2. The turbine building ventilation is normally released without monitoring.

3.2 RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATIONS

The evaluation of the Licensee's proposed RETS against the provisions of NUREG-0472 included the following:

- a review of information provided by the Licensee in the 1979 proposed RETS submittal [16]
- resolution of problem areas in that submittal by means of a site visit [20]
- review of the Licensee's June 17, 1983 final RETS submittal [22].

3.2.1 Effluent Instrumentation

The objective of the RETS with regard to effluent instrumentation is to ensure that all significant liquid and gaseous effluent releases are monitored.

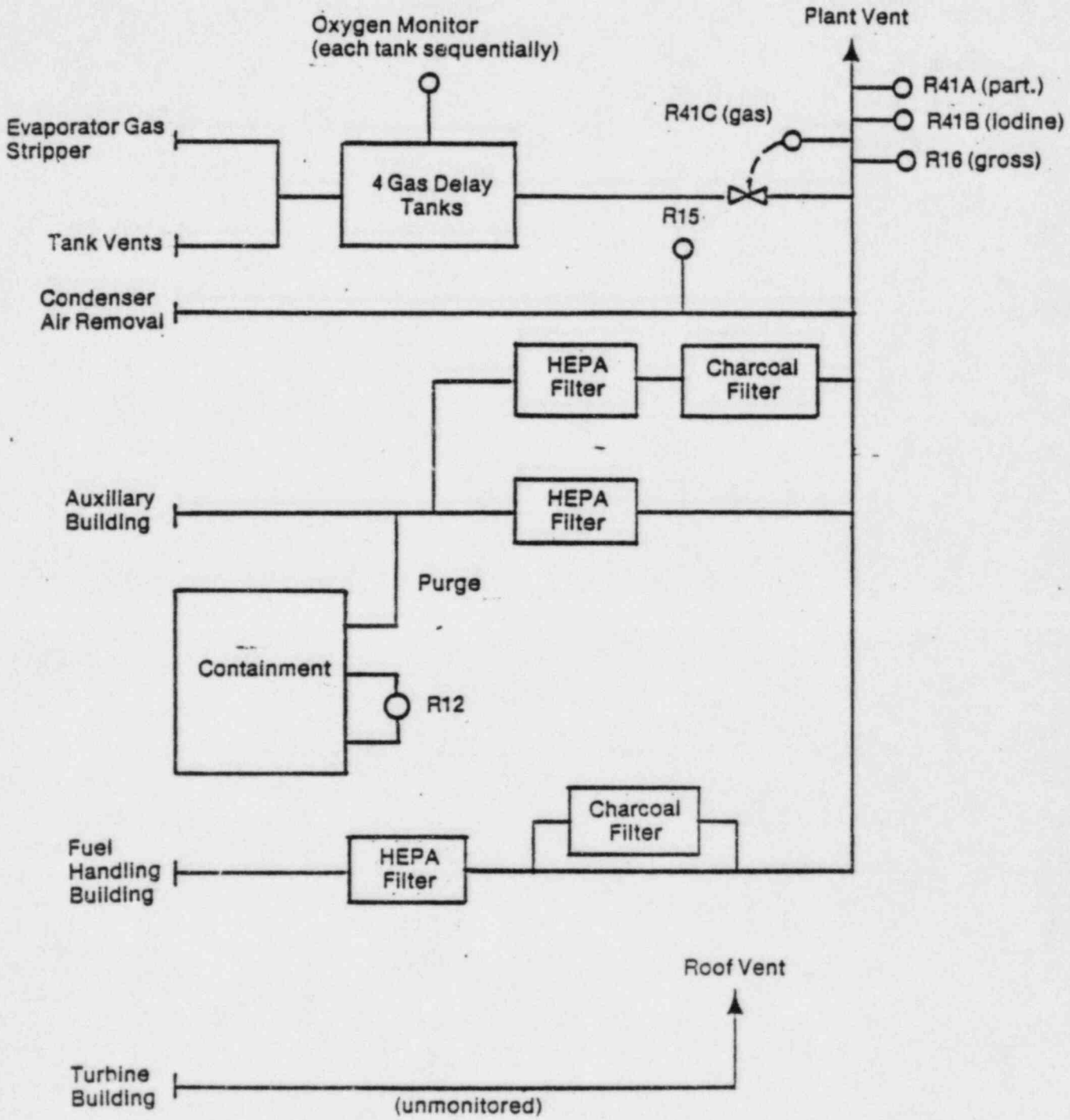

Figure 2. Gaseous Radwaste Treatment Systems, Effluents Paths, and Controls for Salem Nuclear Generating Station Units 1 and 2

The RETS specify that all effluent monitors be operable and that alarm/trip setpoints be determined in order to ensure that radioactive levels do not exceed the maximum permissible concentration (MPC) set by 10CFR20. To further ensure that the instrumentation functions properly, surveillance requirements are also needed in the specifications.

In Section 3/4.3.3.8 of the Licensee's submittal, a commitment is made to monitor and control all significant liquid effluent release paths. The following monitors are provided: liquid radwaste effluent line monitor, steam generator blowdown line monitors, containment fan coolers-service water line monitors, and chemical waste basin line/monitor. These monitors have appropriate alarm/trip setpoints and are demonstrated to be operable by performance of surveillance operations consistent with the model RETS [12]. Flow rate measurement devices are provided for the liquid radwaste effluent line and steam generator blowdown lines in order to determine the total radioactivity released through each liquid release point. The steam generator blowdown line is adequately sampled; however, a continuous composite sampler is not provided. Temporary outside storage tanks, if present, will be provided with tank level indicating devices. The radioactive liquid effluent monitoring instrumentation meets the intent of NUREG-0472.

In Section 3/4.3.3.9 of the Licensee's submittal, a commitment is made to monitor and control all significant gaseous effluent release paths. The plant vent monitor and the waste gas holdup system noble gas monitor are provided for this purpose. The waste gas holdup system is equipped with an oxygen monitor to detect an explosive gas mixture concentration. These monitors are demonstrated to be operable by performance of surveillance operations consistent with the model RETS [12]. Because there are no steam generator blowdown effluent releases directly to the atmosphere, the alternative provisions discussed in NUREG-0133 for the steam generator blowdown vent are applicable. The radioactive gaseous effluent monitoring instrumentation meets the intent of NUREG-0472.

3.2.2 Concentration and Dose Rates of Effluents

3.2.2.1 Liquid Effluent Concentration

In Section 3/4.11.1.1 of the Licensee's submittal, a commitment is made to maintain the concentration of radioactive liquid effluents released from the site to the unrestricted areas to within 10CFR20 limits, and if the concentration of liquid effluents to the unrestricted area exceeds these limits, it will be restored without delay to a value equal to or less than the MPC values specified in 10CFR20. All batches of radioactive liquid waste effluents and continuous releases from the steam generator blowdown effluents are sampled and analyzed periodically in accordance with a sampling and analysis program (Table 4.11-1 of the Licensee's submittal), which meets the intent of NUREG-0472.

3.2.2.2 Gaseous Effluent Dose Rate

In Section 3/4.11.2.1 of the Licensee's submittal, a commitment is made to maintain the offsite gaseous dose rate from the site to areas at and beyond the site boundary to within 10CFR20 limits, and if the concentration of gaseous effluents exceeds these limits or the equivalent dose values, it will be restored without delay to a value equal to or less than these limits.

The radioactive gaseous waste sampling and analysis program (Table 4.11-2 of the Licensee's submittal) provides adequate grab and continuous sampling and analysis of the waste gas storage tanks, containment purge, and plant vent and therefore meets the intent of NUREG-0472.

3.2.3 Offsite Doses from Effluents

The objective of the RETS with regard to offsite doses from effluents is to ensure that offsite doses are kept ALARA, are in compliance with the dose specifications of NUREG-0472, and are in accordance with 10CFR50, Appendix I, and 40CFR190. The Licensee has made a commitment to meet the quarterly and yearly dose limits for (1) liquid effluents, per Section 3.11.2 [12]; (2) air doses for beta and gamma radiation in unrestricted areas due to noble gases as specified in 10CFR50, Appendix I, Section II.B; and (3) dose to any member of

the public from releases of iodine-131, tritium, and particulates with half-lives greater than 8 days within the design objectives of 10CFR50, Appendix I, Section II.C. The Licensee has made a commitment to limit the annual dose or dose commitment to any member of the public due to releases of radioactivity and radiation from uranium fuel cycle sources to within the requirements of 40CFR190. The Licensee has committed to perform the dose calculations according to methods and parameters given in the ODCM. This satisfies the intent of NUREG-0472.

3.2.4 Effluent Treatment

The objective of the RETS with regard to effluent treatment is to ensure that wastes are treated to keep releases ALARA and to satisfy the provisions for technical specifications governing the maintenance and use of radwaste treatment equipment. In Sections 3/4.11.1.3 and 3/4.11.2.4, the Licensee has made a commitment to use the liquid and gaseous radwaste treatment systems and the ventilation exhaust treatment system to reduce the radioactive materials in liquid and gaseous wastes prior to their discharge when the projected dose due to effluents from each reactor unit exceeds prescribed dose limits. The projected doses shall be determined at least once per 31 days in accordance with the ODCM. The Licensee, however, proposes projected dose limits different from those given in the model RETS. The proposed projected dose limits are:

a. Liquid radwaste treatment system. Proposed projected dose limits of 0.375 mrem to the total body or 1.25 mrem to any organ during any calendar quarter, instead of model RETS projected dose limits of 0.06 mrem to the total body or 0.2 mrem to any organ when averaged over 31 days.

b. Gaseous radwaste treatment systems. Proposed projected air dose limits of 0.625 mrad for gamma radiation and 1.25 mrad for beta radation in any calendar quarter, instead of model RETS projected air dose limits of 0.2 mrad for gamma radiation and 0.4 mrad for beta radation when averaged over 31 days.

c. Ventilation exhaust treatment system. Proposed projected dose limit of 1.875 mrem to any organ in any calendar quarter, instead of model RETS projected dose limit of 0.3 mrem to any organ when averaged over 31 days.

The Licensee's proposed projected dose limits do not meet the guidance of NUREG-0472. However, the NRC staff regards the proposed approach to be a reasonable alternative, and it therefore meets the intent of NUREG-0472.

3.2.5 Tank Inventory Limits

The objective of the RETS with regard to tank inventory limits is to ensure that the rupture of a radwaste tank would not cause offsite doses greater than the limits set in 10CFR20 for nonoccupational exposure. In Sections 3/4.11.1.4 and 3/4.11.2.6 of the Licensee's submittal, a commitment is made to limit the radioactive inventory of each outside temporary tank to less than 10 curies (excluding tritium and dissolved or entrained noble gases), and each gas storage tank to less than 36,000 curies of noble gases (considered as xenon-133). The Licensee has committed to a sampling program of the outside temporary tanks and the gas storage tanks to ensure that the radioactive content of the tanks does not exceed the specified limits. The Licensee's commitment to comply with tank inventory limits satisfies the intent of NUREG-0472.

3.2.6 Explosive Gas Mixtures

The objective of the RETS with regard to explosive gas mixtures is to prevent hydrogen explosions in the waste gas system. The waste gas holdup system is a hydrogen-rich system not designed to withstand a hydrogen explosion and therefore Section 3/4.11.2.5B of the model RETS [12] applies to this submittal. In Section 3/4.11.2.5 of the Licensee's submittal, a commitment is made to limit the concentration of oxygen in the waste gas holdup system to less than 2% by volume whenever the hydrogen concentration exceeds 4% by volume. An oxygen monitor is provided to continuously monitor for the possibility of an explosive gas mixture concentration in the waste gas holdup system. The Licensee action specification states that the oxygen concentration will be reduced to appropriate concentration levels when trigger levels are exceeded as specified in the model RETS [12]. In Table 3.3-13, Radioactive Gaseous Effluent Monitoring Instrumentation, redundant channels are not provided as specified in the model RETS [12]; however, the present

system meets the intent of the model RETS on an interim basis according to the current NRC staff position on explosive gas monitoring for PWRs [31].

3.2.7 Solid Radwaste System

The objective of the RETS with regard to the solid radwaste system is to ensure that radwaste will be properly processed and packaged before it is shipped to a burial site, in accordance with 10CFR71 and Specification 3.11.3 of NUREG-0472. In Section 3/4.11.3 of the Licensee's submittal, a commitment is made to use the solid radwaste system to process wet radioactive waste in accordance with a process control program to ensure meeting the shipping and burial ground requirements. The process control program is used to verify the solidification of at least one representative test specimen from every 10 batches of each type of wet radioactive waste. The process control program ensures that radwaste is properly processed and packaged before it is shipped to the burial site, and therefore satisfies the intent of NUREG-0472.

3.2.8 Radiological Environmental Monitoring Program

The objectives of the RETS with regard to environmental monitoring are to ensure that (1) an adequate full-area-coverage (land and water inclusive) monitoring program exists; (2) the requirements of 10CFR50, Appendix I for technical specifications on environmental monitoring are satisfied; and (3) the Licensee maintains both a land-use census and interlaboratory comparison program.

The Licensee has followed NUREG-0472 guidelines, including the Branch Technical Position dated November 1979 [32], and has provided an adequate number of sample locations for pathways identified.

The 40 thermoluminescent dosimeter (TLD) monitoring stations proposed by the Licensee satisfy the specification of NUREG-0472. The Licensee's method of analysis and maintenance of the monitoring program satisfies the requirements of Appendix I, 10CFR50. The Licensee has also made a commitment to describe the specific sample locations in the ODCM. This meets the intent of NUREG-0472.

The commitments to a yearly land-use census within NUREG-0472 specifications and to an ongoing interlaboratory comparison program equivalent to the model RETS guidelines on environmental monitoring meet the intent of NUREG-0472.

3.2.9 Audits and Reviews

The objective of the RETS with regard to audits and reviews is to ensure that audits and reviews of the radwaste and environmental monitoring programs are properly conducted. The Licensee's administrative structure designates the station operations review committee (SORC) and the nuclear review board (NRB) as the two groups responsible for reviews and audits, respectively. In Section 6.5.1.6 of the Licensee's submittal, a commitment is made for review of changes to the process control program and the offsite dose calculation manual and for review of unplanned releases to the environment by the station operations review committee. In Section 6.5.2.8 of the Licensee's submittal, a commitment is made to perform periodic audits of the radiological environmental monitoring program by the nuclear review board. NRC staff considers that audits of the offsite dose calculation manual, process control program, and the quality assurance program for effluent and environmental monitoring are provided by Section 6.5.2.8.a of the Licensee's present technical specifications. The audits and review sections of the submittal meet the intent of NUREG-0472.

3.2.10 Procedures and Records

The objective of the RETS with regard to procedures is to satisfy the provisions for written procedures for implementing the ODCM, PCP, and QA program. It is also an objective of RETS to properly retain the documented records related to the environmental monitoring program and certain QA procedures. The Licensee has made a commitment to establish, implement, and maintain written procedures for the PCP, ODCM, and QA programs which satisfy the provisions of NUREG-0472. The Licensee, also, has made a commitment to retain the records of the radiological environmental monitoring program, and this meets the intent of NUREG-0472.

3.2.11 Reports

In addition to the reporting requirements of Title 10, Code of Federal Regulations (10CFR), the objective of the RETS with regard to administrative controls is also to ensure that appropriate periodic and special reports are submitted to the NRC.

The Licensee has made a commitment to follow applicable reporting requirements stipulated by 10CFR regulations and also the following reports specified by NUREG-0472:

1. Annual radiological environmental operating report. In Section 6.9.1.10 of the Licensee's submittal, a commitment is made to provide an annual radiological environmental operating report that includes summaries, interpretations, and statistical evaluation of the results of the environmental surveillance program. The report also includes the results of land use censuses, and participation in an inter-laboratory comparison program specified by Specification 3.12.3 of NUREG-0472.

2. Semiannual radioactive and solid waste release reports. In Section 6.9.1.11 of the Licensee's submittal, a commitment is made to provide semiannual radioactive effluent and solid waste release reports which include a summary of radioactive liquid and gaseous effluents and solid waste released, an assessment of offsite doses, and a list of unplanned releases. Listing of new location for dose calculations identified by the land use census as well as any changes to ODCM are also included in the report.

3. Prompt notification with written followup. In Section 6.9.1.8 of the Licensee's submittal, a commitment is made to provide prompt notification with written followup for the following:

   - Offsite releases of radioactive materials in liquid and gaseous effluents which exceed the liquid concentration limits of Section 3.11.1.1 and the gaseous dose rate limits of Section 3.11.2.1.

   - Exceeding the limits of Section 3.11.1.4 for the storage of radioactive liquids in outside tanks and of Section 3.11.2.6 for the storage of noble gases in the gas storage tanks.

4. Thirty-day written report. In Section 6.9.1.9 of the Licensee's submittal, a commitment is made to provide a 30-day written report for an unplanned offsite release of more than 1 curie of radioactive material in liquid effluents or of more than 150 curies of noble gas in gaseous effluents.

5. Special report. In Section 6.9.2 of the Licensee's submittal, a commitment is made to provide a special report for exceeding Section 3.11.1.2 liquid effluent dose limits, Sections 3.11.2.2 and 3.11.2.3 gaseous effluent dose limits, and Section 3.11.4 total dose limits. A special report is required for the extended inoperability of liquid and gaseous radwaste treatment systems and for measured levels of radioactivity in an environmental sampling medium determined to exceed the reporting levels of Table 3.12-2.

These reporting commitments have satisfied the provisions of NUREG-0472.

3.2.12 Implementation of Major Programs

One objective of the administrative controls is to ensure that implementation of major programs, such as the PCP, ODCM, and major changes to the radioactive waste treatment system, follows appropriate administrative procedures. The Licensee has made a commitment to review, report, and implement major programs such as the PCP, ODCM, and major changes to the radioactive waste treatment system. This meets the intent of NUREG-0472.

3.2.13 Design Features

The objective of the RETS with regard to design features is to provide a map of the site area defining the site boundary and unrestricted areas within the site boundary, as well as defining points of release for liquid and gaseous effluents and points where liquid effluents leave the site. The Licensee has provided an acceptable site map which meets the intent of NUREG-0472.

3.3 OFFSITE DOSE CALCULATION MANUAL (ODCM)

As specified in NUREG-0472, the ODCM is to be developed by the Licensee to document the methodology and approaches used to calculate offsite doses and maintain the operability of the effluent systems. As a minimum, the ODCM should provide equations and methodology for the following topics:

- o alarm and trip setpoint on effluent instrumentation
- o liquid effluent concentration in unrestricted areas

- o gaseous effluent dose rate at or beyond the site boundary
- o liquid and gaseous effluent dose contributions
- o liquid and gaseous effluent dose projections.

In addition, the ODCM should contain flow diagrams, consistent with the systems being used at the station, defining the treatment paths and the components of the radioactive liquid, gaseous, and solid waste management systems. Of course, these diagrams should be consistent with the systems being used at the station. A description and location of samples in support of the environmental monitoring program are also needed in the ODCM.

3.3.1 Evaluation

The Licensee has followed the methodology of NUREG-0133 [9] to determine the alarm and trip setpoints for the liquid and gaseous effluent monitors, which ensures that the maximum permissible concentrations (MPC), as specified in 10CFR20, will not be exceeded by discharges from various liquid or gaseous release points. To augment conservatism and to address the case of simultaneous releases, the Licensee has calculated monitor setpoints using a realistic worst-case combination of MPC values, flow rates, dispersion coefficients, isotopic composition, and a 25% meter error factor. Detailed parameters are given for calculating individual monitor setpoints.

The Licensee demonstrated the method of calculating the radioactive liquid concentration by identifying the liquid effluent sources, by providing parameters and equations needed to determine effluent concentrations, and by providing a method for analyzing representative samples prior to and after releasing liquid effluents into the circulating water discharge. The method provides added assurance of compliance with 10CFR20 for liquid effluent releases.

Methods are also included for showing that dose rates at or beyond the site boundary due to noble gases, iodine-131, tritium, and particulates with half-lives greater than 8 days are in compliance with 10CFR20. In this calculation, the Licensee has considered effluent releases from the waste gas decay tanks, containment purge, and releases from ventilation systems, all

of which are discharged through the plant vent, and are treated as mixed mode releases. The Licensee has used the highest annual average values of relative concentration (X/Q) and relative deposition (D/Q) to determine the controlling locations. For dose rate calculations from noble gases, the Licensee has considered a semi-infinite cloud model. The Licensee intends to use the maximally exposed individual and the critical organ as the reference receptor. The Licensee has considered exposure pathways from inhalation and the milk and ground pathway, although milk ingestion exposure from ground-plane deposition is not strictly required for gaseous dose rate calculations. However, the equation used by the Licensee on page 6.2 of the submittal does not agree with the corresponding equation given in Section 5.3.1 of NUREG-0133.

Evaluation of the cumulative dose is to ensure that the quarterly and annual dose design objectives specified in the RETS are not exceeded.

For liquid releases, the Licensee has identified fish and invertebrate consumption as the two viable pathways. In the calculation, the Licensee uses a near-field dilution factor specific to the plant; all other key parameters follow the suggested values given in Regulatory Guide 1.109. As in the case of dose rate calculations, the Licensee has used the maximally exposed individual as the reference receptor. To correctly assess the cumulative dose, the Licensee intends to estimate the dose once per 31 days.

Evaluation of the cumulative dose from noble gas releases includes both beta and gamma and air doses at and beyond the site boundary. The critical organs under consideration are the total body and skin for gamma and beta radiation, respectively. Again, the Licensee has used the maximum (X/Q) values as discussed earlier and has followed the methodology and parameters of NUREG-0133 and Regulatory Guide 1.109.

For iodine-131, tritium, and particulates with half-lives greater than 8 days, the Licensee has provided a method to demonstrate that cumulative doses calculated from the release meet both quarterly and annual design objectives. The Licensee has demonstrated a method of calculating the dose using maximum

annual average (X/Q) values for the inhalation pathway and has included (D/Q) values for the milk and ground-plane pathway. However, the Licensee has yet to provide the methodology and key parameters for deriving the dose factors R_i and P_i shown in Table 6.1 of the submittal.

Using the existing methodology for gaseous and liquid dose calculations, the Licensee has demonstrated a procedure to determine the quarterly dose and to ensure that the design objectives for the liquid radwaste system and the gaseous radwaste treatment system are not exceeded.

Adequate flow diagrams defining the effluent paths and components of the radioactive liquid and gaseous waste treatment systems have been provided by the Licensee. Radiation monitors specified in the Licensee-submitted RETS are also properly identified in the flow diagrams.

The Licensee has provided a description of sampling locations in the ODCM and has identified them in Table 7-1 and also in Figures 7-1 and 7-2 of that document. This description is consistent with the sampling locations specified in the Licensee's RETS Table 3.12-1 on environmental monitoring.

In summary, the Licensee's ODCM uses documented and approved methods that are consistent with the methodology and guidance in NUREG-0133, and therefore is an acceptable reference, except the following deficiencies were found in the submittal:

1. Figure 2-2, "Gaseous Releases to the Environment," does not indicate containment purge releases.

2. The equation given on page 6.2 does not agree with the corresponding equation given in Section 5.3.1 of NUREG-0133. Also, methodology and key parameters are not provided by the Licensee in deriving the equation.

3. Table 6.1 on page 6.6 should be labeled "R_i, Dose Factors for Radioiodines and Radioactive Particulates in Gaseous Effluents" instead of "P_i, Dose Parameters for Radioiodines and Radioactive Particulates in Gaseous Effluents." Also, methodology and key parameters for the derivations of R_is and P_is are not given.

4. The table of contents for the ODCM calls for a Section 7.2, "Estimate of Direct Radiation Dose," which has not been included in the ODCM submittal.

4. CONCLUSIONS

Table 1 summarizes the results of the final review and evaluation of the submittal for Salem Nuclear Generating Station Units 1 and 2.

The following conclusions have been reached:

1. The Licensee's proposed RETS submitted June 17, 1983 [22] meets the intent of the NRC staff's "Standard Radiological Effluent Technical Specifications," NUREG-0472, for Salem Nuclear Generating Station Units 1 and 2.

2. The Licensee's proposed ODCM, submitted June 24, 1983 [25], uses documented and approved methods consistent with the criteria of NUREG-0133, except for the deficiencies listed in the summary of the evaluation.

3. The Licensee has not yet submitted a PCP for review. Review of the formal submittal of PCP will be recorded in a supplement to this TER.

Table 1. Evaluation of Proposed Radiological Effluent Technical Specifications (RETS), Salem Nuclear Generating Station Units 1 and 2

	Technical Specifications		Replaces or Updates Existing Tech. Specs. (Section)	Evaluation
	NRC Staff Std. RETS NUREG-0472 (Section)*	Licensee Proposal (Section)		
Effluent Instrumentation	3/4.3.3.3.10 3/4.3.3.3.11	3/4.3.3.3.8 3/4.3.3.3.9	2.3.1, 2.3.2 2.3.3, 2.3.4 (Appendix B)	Meets the intent of NRC criteria
Radioactive Effluents	3/4.11.1.1 3/4.11.2.1	3/4.11.1.1 3/4.11.2.1	2.3.1, 2.3.2 2.3.3, 2.3.4 (Appendix B)	Meets the intent of NRC criteria
Offsite Doses	3/4.11.1.2, 3/4.11.2.2, 3/4.11.2.3, 3/4.11.4	3/4.11.1.2 3/4.11.2.2 3/4.11.2.3 3/4.11.4	2.3.1, 2.3.3 (Appendix B)	Meets the intent of NRC criteria
Effluent Treatment	3/4.11.1.3 3/4.11.2.4	3/4.11.1.3 3/4.11.2.4	2.3.2, 2.3.4 (Appendix B)	Meets the intent of NRC criteria
Tank Inventory Limits	3/4.11.1.4 3/4.11.2.6	3/4.11.1.4 3/4.11.2.6	2.3.1, 2.3.3 (Appendix B)	Meets the intent of NRC criteria
Explosive Gas Mixtures	3/4.11.2.5B	3/4.11.2.5	Not addressed	Meets the intent of NRC criteria in the interim
Solid Radioactive Waste	3/4.11.3	3/4.11.3	2.3.5 (Appendix B)	Meets the intent of NRC criteria
Environmental Monitoring	3/4.12.1	3/4.12.1	3.2 (Appendix B)	Meets the intent of NRC criteria
Audits and Reviews	6.5.1, 6.5.2	6.5.1, 6.5.2	6.5.1, 6.5.2.7 (Appendix A)	Meets the intent of NRC criteria
Procedures and Records	6.8, 6.10	6.8, 6.10	6.8, 6.10 (Appendix A)	Meets the intent of NRC criteria

*Section number sequence is according to NUREG-0472, Rev. 3 [12].

Table 1 (Cont)

	Technical Specifications		Replaces or Updates Existing Tech. Specs. (Section)	Evaluation
	NRC Staff Std. RETS NUREG-0472 (Section)*	Licensee Proposal (Section)		
Reports	6.9.1.9, 6.9.1.11, 6.9.1.12, 6.9.2	6.9.1.8, 6.9.1.9, 6.9.1.10, 6.9.1.11, 6.9.2	6.9.1.4, 6.9.1.6, 6.9.1.9, 6.9.2 (Appendix A) 5.6 (Appendix B)	Meets the intent of NRC criteria
Implementation of Major Programs	6.13, 6.14, 6.15	6.13, 6.14, 6.15	Not addressed	Meets the intent of NRC criteria

5. REFERENCES

1. "Radiological Effluent Technical Specifications for Pressurized Water Reactors," Rev. 2
   NRC, July 1979
   NUREG-0472

2. Title 10, Code of Federal Regulations, Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion, 'As Low As Is Reasonably Achievable,' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents"

3. Title 10, Code of Federal Regulations, Part 50, Appendix I, Section V, "Effective Dates"

4. Title 10, Code of Federal Regulations, Part 20, "Standards for Protection Against Radiation"

5. Title 40, Code of Federal Regulations, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations"

6. Title 10, Code of Federal Regulations, Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants"

7. Title 10, Code of Federal Regulations, Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants"

8. "Radiological Effluent Technical Specifications for Boiling Water Reactors," Rev. 2
   NRC, July 1979
   NUREG-0473

9. "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, A Guidance Manual for Users of Standard Technical Specifications"
   NRC, October 1978
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10. C. Willis and F. Congel (NRC)
    "Summary of Draft Contractor Guidance of RETS"
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11. F. Congel (NRC)
    Memo to RAB Staff (NRC)
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    August 9, 1982

12. "Radiological Effluent Technical Specifications for Pressurized Water Reactors," Rev. 3, Draft 7', intended for contractor guidance in reviewing RETS proposals for operating reactors
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13. Additional Information Required for Appendix I Implementation, Salem Nuclear Generating Station, Unit Nos. 1 and 2, Docket Nos. 50-272 and 50-311
Letter of Transmittal, June 4, 1976
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14. Responses to Additional Information Request for Salem Nuclear Generating Station, Units Nos. 1 and 2
Letter of Transmittal October 26, 1976

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Letter of Transmittal, December 1, 1976

16. F. P. Librizzi (PSE&G)
Letter to A. Schwencer (NRC)
November 26, 1979

17. General Contents of the Offsite Dose Calculation Manual," Rev. 1
NRC, 1979

18. "Radiological Effluent Technical Specification Implementation, Comparison of Plant and Model RETS"
Franklin Research Center, Draft dated April 16, 1982

19. "Radiological Effluent Technical Specification Implementation, Technical Review of Plant Offsite Dose Calculation Manual"
Franklin Research Center, Draft dated April 16, 1982

20. Trip Report to Salem Nuclear Power Station
Trip Date: June 14-15, 1982
C. Fernandez/S. Pandey (FRC) to F. Congel/C. Willis/W. Meinke (NRC)
August 13, 1982

21. Draft Final Salem Unit 2 RETS Submittal
Tranmitted to S. Pandey (FRC) from W. Meinke (NRC)
May 10, 1983

22. E. A. Liden (PSE&G)
Letter to S. Varga (NRC)
June 17, 1983

23. W. Meinke (NRC)
Memo to S. Pandey (FRC)
June 24, 1983

24. Informal Technical Communication
from C. Fernandez/S. Pandey (FRC) to W. Meinke (NRC)
"RETS Review Questions"
May 27, 1983

25. E. A. Liden (PSE&G)
Letter to S. A. Varga (NRC)
Subject: ODCM
June 24, 1983

26. "Comparison of Specification NUREG-0472, Radiological Effluent Technical Specifications for PWRs, vs. Licensee Final Submittal of Radiological Effluent Technical Specifications, dated May 10, 1983, for Salem Nuclear Generating Station"
Franklin Research Center
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28. C. Willis (NRC)
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"Status of NRC Radiological Effluent Technical Specification Activities"
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31. W. P. Gammill (NRC)
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"Current Position on Radiological Effluent Technical Specifications (RETS) Including Explosive Gas Controls"
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33. Methods for Demonstrating LWR Compliance with the EPA Uranium Fuel Cycle Standard (40CFR190)
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