TECHNICAL EVALUATION REPORT

RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATION IMPLEMENTATION (A-2)

PHILADELPHIA ELECTRIC COMPANY

PEACH BOTTOM ATOMIC POWER STATION UNITS 2 AND 3

NRC DOCKET NO. 50-277, 50-278

NRC TAC NO. 8044, 8122

NRC CONTRACT NO. NRC-03-81-130

FRC PROJECT C5506

FRC ASSIGNMENT 4

FRC TASKS 108, 109

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June 29, 1983

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Date: 6/28/83	Date: 6/28/83	Date: 6-28-83

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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 Peach Bottom Atomic Power Station Units 2 and 3 with regard to Radiological Effluent Technical Specifications (RETS), the Offsite Dose Calculation Manual (ODCM), and the Process Control Program (PCP).

The evaluation uses criteria proposed by the NRC staff in the Model Technical Specifications for boiling water reactors (BWRs), NUREG-0473 [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 [3]. The licensees of all operating reactors were required 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-0473 [1] for BWRs and NUREG-0472 for pressurized water reactors (PWRs) [8]. 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 were issued in February 1979 to each utility at individual meetings. In response to the NRC's request, operating reactor licensees 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 of the guidelines in the current version of Revision 2 is needed to 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 site visits. The new guidance on these changes was presented at 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. Since the equivalent version of NUREG-0473 for BWRs has not been made available by the NRC, the Licensee-submitted BWR RETS were evaluated largely against the provisions specified by NUREG-0473, Revision 2 [1]. Updated provisions common to both BWRs and PWRs, as specified by Reference 12, were also adopted for the review. In addition, some changes made specifically to BWRs [13] were also included as added guidance.

1.3 PLANT-SPECIFIC BACKGROUND

In response to the NRC's request, the Licensee, Philadelphia Electric Company (PECO), submitted a RETS proposal dated March 1, 1979 [14] on behalf of Peach Bottom Atomic Power Station Units 2 and 3, which included an ODCM submittal. The Licensee's RETS submittal did not follow the model RETS format (NUREG-0473) for BWRs. In an initial evaluation by the Franklin Reseach Center (FRC), an independent review team, the Licensee's RETS and ODCM submittals were evaluated against the model RETS (NUREG-0473, Revision 2) and assessed for compliance with the stipulated provisions. Copies of the draft review, dated June 1, 1982 [15, 16], were delivered to the NRC and the Licensee prior to a site visit by the reviewers.

The site visit was conducted on June 29-30, 1982 by the reviewers with the participation of PECO personnel and the NRC staff. Discussions focused on the initial review of the proposed changes to the RETS and on the technical evaluation of the ODCM. The deficiencies in the Licensee's proposed RETS were

considered, deviations from NRC guidelines were pointed out, many differences were clarified, and a few items remained unresolved pending justification by the Licensee. These issues are summarized in Reference 17.

The final version of the Peach Bottom RETS and ODCM [18], dated November 29, 1982, was submitted to the NRC and transmitted to the FRC reviewers together with justifications provided by the Licensee. A PCP was not included in the submittal. Final evaluation of RETS was detailed in a comparison report [19] which used NUREG-0473, Revision 2 [1], the updated generic provisions specified by the draft version of NUREG-0472, Revision 3 [12], and provisions specific to BWRs [13] to evaluate the Licensee's submittal. The comparison report also incorporates NRC comments [20, 21] which serve as additional staff positions regarding plant-specific issues.

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 and an interlaboratory comparison program, 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 [22, 23], clarifications [24, 25], and branch positions [26, 27, 28, 29] establishing a policy that guides 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 was based on the following NRC guidelines: Branch Technical Position, "General Content of the Offsite Dose Calculation Manual" [30]; NUREG-0133 [9]; and Regulatory Guide 1.109 [31]. 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 SYSTEM

This section briefly describes the liquid and gaseous effluent radwaste treatment systems, release paths, and control systems installed at Peach Bottom Atomic Power Station Units 2 and 3; both units are BWRs.

3.1.1 Radioactive Liquid Effluent

Major releases of liquid effluents from the Peach Bottom Station are discharged via the liquid radwaste effluent line (Figure 1). This effluent path handles the majority of the radioactive discharges; the effluents are normally collected, processed, and monitored before being released in batches. Other potential effluent lines are the main service water line, the emergency service water lines, the high pressure service water line, and the turbine building sumps.

Radioactive liquid wastes are discharged into the Susquehanna River through the circulating water discharge canal 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, chemical wastes, floor drains, and laundry drains are processed through filters and demineralizers prior to release. These wastes are monitored and controlled by the liquid radwaste effluents radiation monitor. As a safety measure, the liquid radwaste radiation monitor is provided with automatic termination of release upon a high-concentration alarm signal. Potential leakage of radioactive material into the service water effluents and emergency service water effluents is monitored by gross activity radiation monitors. The high pressure service water effluents are an insignificant source of radioactive material discharge and therefore are not monitored.

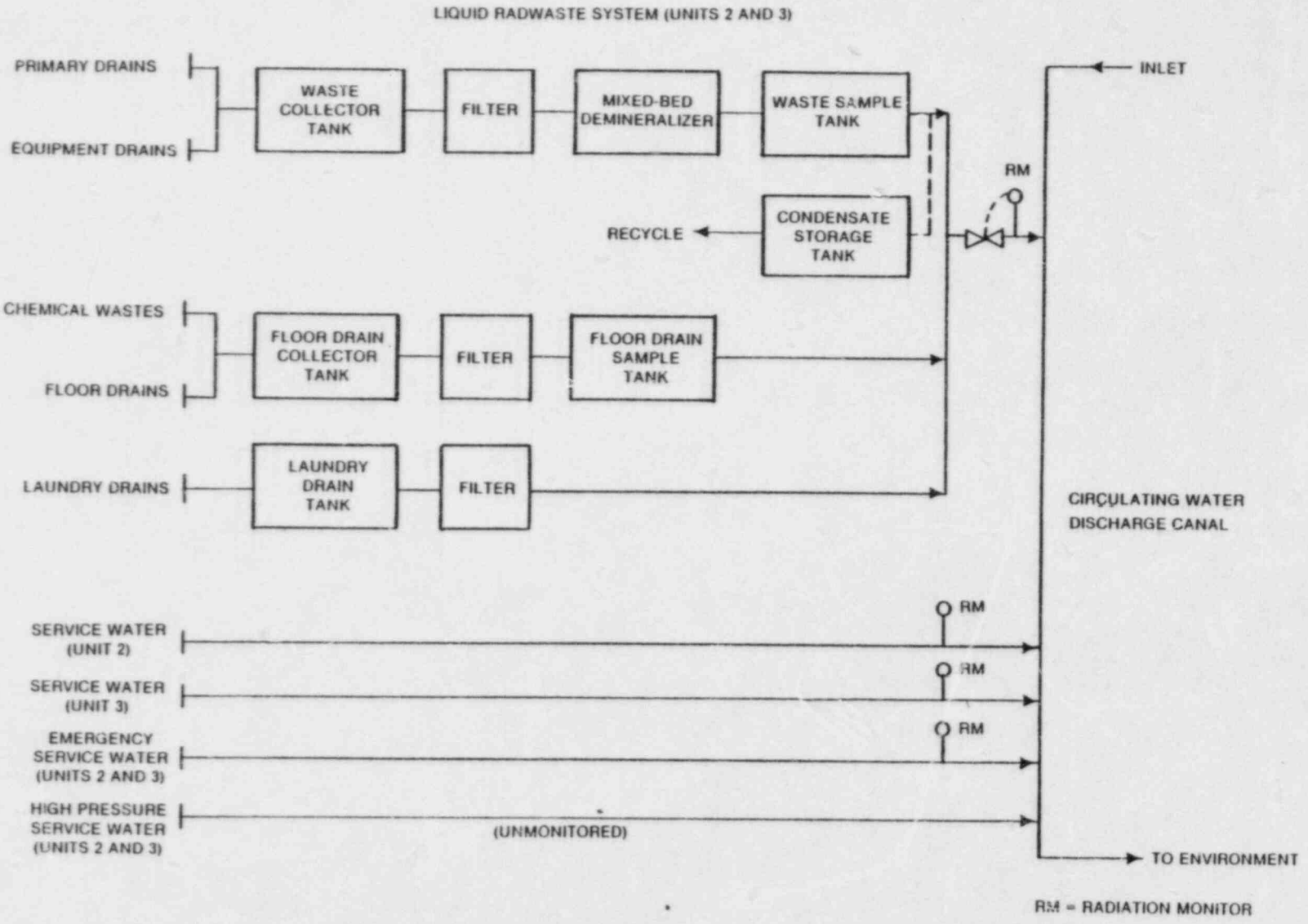

Figure 1. Liquid Radwaste Treatment Systems, Effluent Paths, and Controls for Peach Bottom Atomic Power Station Units 2 and 3

3.1.2 Radioactive Gaseous Effluent

A waste gas holdup system is provided for each unit of the Peach Bottom plant. The processed gases from each unit are routed to the plant main stack for dilution and elevated release to the atmosphere (Figure 2). The radwaste treatment system includes the 3-day (nominal) delay line and HEPA filter for each unit.

A diagram showing the location of radioactive gaseous effluent monitors and process equipment is shown in Figure 2. Gaseous effluents originating from the main condenser offgas, the gland seal exhaust, and the standby gas treatment system are discharged through the plant main stack. Redundant radiation monitors are provided at the main stack to monitor effluent releases. The waste gas holdup system is provided with two hydrogen monitors downstream of the recombiners to prevent the possibility of explosive gas mixture concentrations. Ventilation exhaust releases from the reactor building ventilation exhaust, turbine building ventilation exhaust, radwaste building ventilation exhaust, and the recombiner building ventilation exhaust are released through the reactor building vents. The Unit 2 and Unit 3 reactor building vents are provided with redundant effluent radiation monitors and are considered ground-level releases in dose calculations.

3.2 RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATIONS

The evaluation of the Licensee's proposed RETS against the provisions of NUREG-0473 included the following: (1) a review of information provided in the Licensee's March 1, 1979 submittal [14], (2) the resolution of problem areas in that submittal by means of a site visit [17], and (3) a review of the Licensee's November 29, 1982 submittal [18].

3.2.1 Effluent Instrumentation

The objective of the RETS with regard to effluent instrumentation is to ensure that all significant releases of radioactivity are monitored. The RETS specify that all effluent monitors be operable and alarm/trip setpoints be determined to ensure that radioactivity levels do not exceed the maximum

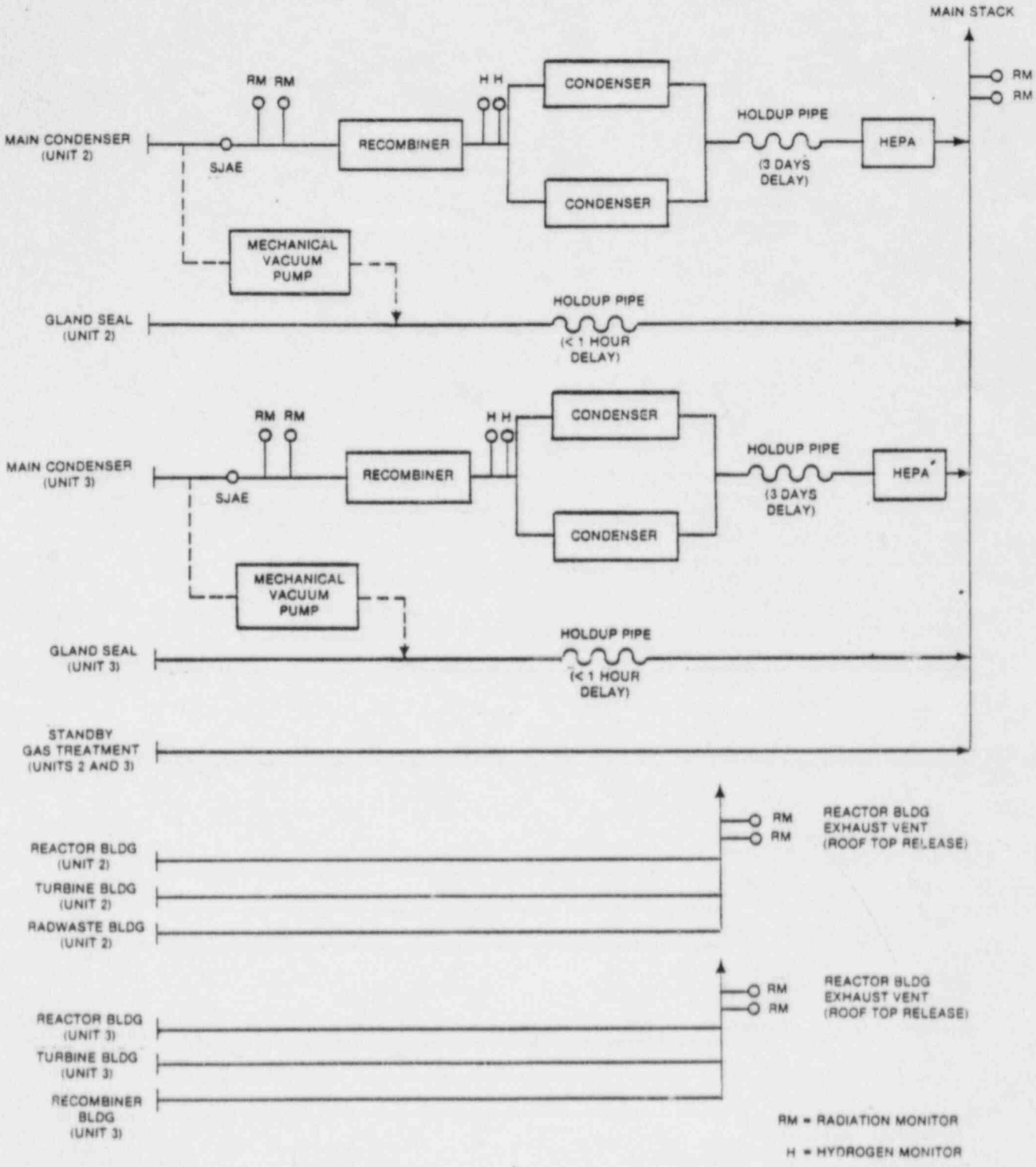

Figure 2. Gaseous Radwaste Treatment Systems, Effluent Paths, and Controls for Peach Bottom Atomic Power Station Units 2 and 3

permissible concentration (MPC) set by 10CFR20. To further ensure that the instrumentation functions properly, surveillance requirements are needed in the specifications.

3.2.1.1 Radioactive Liquid Effluent Monitoring Instrumentation

In Section 3/4.3.8.B of the Licensee's submittal, a commitment is made to monitor and control all significant liquid effluent releases to the environment. A liquid radwaste effluents radiation monitor is provided with an associated flow monitor and automatic control function to isolate a high radioactive release discharge. The effluent monitor has appropriate alarm/trip setpoints and is demonstrated to be operable by performance of surveillance operations consistent with the model RETS [12]. Although technical specifications are not provided for the service water system effluent radiation monitor, the Licensee states in the Updated Final Safety Analysis Report that the service water system has a radiation monitor to detect potential radioactive leakage into the environment. The Licensee states that there are no outside liquid holdup tanks which require tank level indicating devices as specified in the model RETS [12]. The radioactive liquid effluent monitoring instrumentation meets the intent of NUREG-0473.

3.2.1.2 Radioactive Gaseous Effluent Monitoring Instrumentation

In Section 3/4.3.8.C of the Licensee's submittal, a commitment is made to monitor and control all significant gaseous effluent release paths. The main stack monitor and the reactor building exhaust vent monitor are provided for this purpose. The condenser air removal system is equipped with the steam jet air ejector monitor to measure offgas release rate prior to input to the waste gas holdup system. Redundant hydrogen monitors are provided downstream of the recombiners in the waste gas holdup system to detect the possibility of an explosive gas mixture concentration as specified in the model RETS [12]. These monitors are demonstrated to be operable by performance of surveillance operations, and therefore the radioactive gaseous effluent monitoring instrumentation meets the intent of NUREG-0473.

3.2.2 Concentration and Dose Rates of Effluents

3.2.2.1 Liquid Effluent Concentration

In Section 3/4.8.B.1 of the Licensee's submittal, a commitment is made to maintain the concentration of radioactive liquid effluents released to unrestricted areas to within 10CFR20 limits, and, if the concentration of liquid effluents exceeds these limits, the concentration will be restored without delay to a value equal to or less than the MPC specified in 10CFR20. All batches of radioactive liquid effluents from the waste sample tanks are sampled and analyzed in accordance with a sampling and analysis program which meets the intent of NUREG-0473. Continuous releases from the emergency service water and main service water systems are not sampled on a periodic basis. The Licensee, however, states in the Updated Final Safety Analysis Report that the main service water system has a radiation monitor to continuously monitor the service water effluent discharges. This technical specification is consistent with the intent of NUREG-0473.

3.2.2.2 Gaseous Effluent Dose Rate

In Section 3/4.8.C.1 of the Licensee's submittal, a commitment is made to maintain the offsite dose rate from radioactive gaseous effluents to areas at and beyond the site boundary within 10CFR20 limits, or the equivalent dose rate values prescribed by Section 3.11.2.1 of NUREG-0473. If the dose rate of gaseous effluents exceeds these limits, it will be restored without delay to a value equal to or less than these limits. This commitment satisfies the provisions of NUREG-0473.

The radioactive gaseous waste sampling and analysis program (Table 4.8.2 of the Licensee's submittal) provides adequate sampling and analysis of the main offgas stack and reactor building vent exhaust stack, and therefore meets the intent of NUREG-0473.

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 and are in accordance with

10CFR50, Appendix I, and 40CFR190. The Licensee has made a commitment to (1) meet the quarterly and yearly dose limitations for liquid effluents, per Section II.A of Appendix I, 10CFR50; (2) restrict the air doses for beta and gamma radiation in unrestricted areas as specified in 10CFR50, Appendix I, Section II.B; (3) maintain the dose level at and beyond the site boundary from release of iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half lives greater than 8 days within the design objectives of 10CFR50, Appendix I, Section II.C; and (4) limit the annual dose from radioactive materials from the plant to any member of the public to within the requirements of 40CFR190. Since Units 2 and 3 have a shared radwaste treatment system and common effluent release points, the Appendix I dose commitment limits proposed by the Licensee for the combined effluent release from Units 2 and 3 are twice the design objective contained in Appendix I for one unit. In each pertinent section, the Licensee has made a commitment to perform dose calculations in accordance with methods given in the ODCM. These offsite dose specifications satisfy the intent of NUREG-0473.

3.2.4 Effluent Treatment

The objectives of the RETS with regard to effluent treatment are to ensure that wastes are treated to keep releases ALARA and to satisfy the provisions of Technical Specifications governing the maintenance and use of radwaste treatment equipment. The Licensee has made a commitment to use the liquid radwaste treatment systems (Section 3/4.8.D.4 of the Licensee's submittal) when the projected dose, averaged over 31 days, exceeds 25% of the annual dose design objectives, prorated monthly. Due to a shared liquid treatment system common to Units 2 and 3, the proposed projected dose limits are twice the design objective limits for one unit. For gaseous radwaste, the Licensee proposes to treat the effluents by operating the waste gas holdup system whenever the steam jet air ejector is in operation. The Licensee's existing gaseous radwaste treatment system includes a nominal 3-day offgas holdup line and a HEPA filter. The Licensee has also made a commitment to use the ventilation exhaust treatment system when the projected monthly dose exceeds the limits specified by NUREG-0473. The Licensee has also made a commitment

in the ODCM to calculate the projected dose on a monthly basis. It is determined that the Licensee's proposal meets the intent of NUREG-0473.

3.2.5 Radioactivity Inventory Limits

The objective of the RETS with regard to the liquid 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. Also, the gaseous radioactivity release inventory is to be limited to within a rate of 100 microcuries per second per megawatt thermal during the operation of the main condenser air ejector. The Licensee states that there are no outside liquid holdup tanks to which the model RETS [12] Technical Specification 3.11.1.4 applies. For radioactive releases from the main condenser air ejector, a release rate limit of 320,000 microcuries/sec has been set for noble gases, which is based on the rated thermal power of 3293 MWt at both Peach Bottom Units 2 and 3. The Licensee's proposed technical specification with regard to radioactivity inventory and release rate limits satisfies the intent of NUREG-0473.

3.2.6 Explosive Gas Mixtures

The objective of the RETS with regard to explosive gas mixtures is to prevent hydrogen explosions in waste gas systems. The main condenser offgas system is not designed to withstand a hydrogen explosion. The Licensee has, therefore, made a commitment to maintain a safe concentration of hydrogen in the main condenser offgas system using redundant hydrogen monitors downstream of the recombiners to detect the possibility of an explosive gas mixture concentration. This commitment satisfies the intent of NUREG-0473.

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 the burial site. Specification 3.11.3 of NUREG-0473 provides for the establishment of a PCP to show compliance with this objective. The

Licensee has made a commitment to implement such a program in accordance with a PCP and to thus ensure that radwaste is properly processed and packaged before it is shipped to the burial site. This meets the intent of NUREG-0473.

3.2.8 Radiological Environmental Monitoring Program

The objectives of the RETS with regard to environmental monitoring are to ensure that (1) adequate and 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. In all cases, the Licensee has followed NUREG-0473 guidelines, including the Branch Technical Position dated November 1979 [27], and has provided an adequate number of sample locations for pathways identified. The Licensee's methods of analysis and maintenance of yearly records satisfy the NRC guidelines and meet the intent of 10CFR50, Appendix I. The Licensee has also made a commitment to document the environmental monitoring sample locations in the ODCM, which meets the intent of NUREG-0473. The specification for the land use census satisfies the provisions of Section 3.12.2 of NUREG-0473 by providing for an annual census in the specified areas. The Licensee participates in an interlaboratory comparison program approved by the NRC and reports the results in the Annual Radiological Environmental Operating Report, which also meets the intent of NUREG-0473.

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 Plant Operation Review Committee (PORC) and the Operation and Safety Review Committee (OSRC) as the groups responsible for the review and audit of the radiological environmental monitoring program and the ODCM. The PORC is responsible for reviewing the procedures associated with these programs. The

OSRC is responsible for auditing the program as often as is specified under NUREG-0473.

3.2.10 Procedures and Records

The objective of the RETS with regard to procedures is to satisfy the written procedures specified in NUREG-0473 for implementing the ODCM, the PCP, and the quality assurance (QA) program. It is also an objective of RETS to properly retain the documented records in relation 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 program according to the updated provisions of model RETS [12]. The Licensee intends to retain the records of the radiological environmental monitoring program for the duration of the facility operating license. It is determined that the Licensee has met the intent of NUREG-0473.

3.2.11 Reports

The objective of the RETS with regard to administrative controls is to ensure that appropriate periodic and special reports are submitted to the NRC, and that these reports meet the requirements of 10CFR50.36a.

3.2.11.1 Routine Reports

In Section 6.9.3 of the Licensee's submittal, a commitment is made to provide the NRC with 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 a summary of the radiological environmental monitoring program, the results of the land use censuses, and the results of Licensee participation in an interlaboratory comparison program specified by Specification 3.12.3 of NUREG-0473.

Section 6.9.3 of the Licensee's submittal also states the Licensee's commitment to provide semiannual radioactive effluent release reports which

include a summary of radioactive liquid and gaseous effluents and solid waste released and a list of unplanned releases. A list of new locations for dose calculations identified by the land use census and changes to the ODCM are also included in the report. The semiannual radioactive effluent release reports will be submitted within 60 days after January 1 and July 1 of each year. The Licensee also proposes to submit an annual radiation dose assessment report within 120 days after January 1 of each year, which will include an annual summary of meteorological data and an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released.

3.2.11.2 Non-Routine Reports

In the Licensee's submittal, a commitment is made to provide a special report (according to Section 6.9.2 of the Licensee's submittal) for each of the following in NUREG-0473:

- exceeding liquid effluent dose limits specified in Specifications 3.11.1.2 and 3.11.1.3
- exceeding gaseous effluent dose rate limits specified in Specifications 3.11.2.2, 3.11.2.3, and 3.11.2.4
- exceeding total dose limits specified in Specification 3.11.4
- measured levels of radioactivity in an environmental sampling medium determined to exceed the reporting level of Table 3.12.2.

These reporting commitments meet the intent of NUREG-0473.

3.2.12 Implementation of Major Programs

One objective of the administrative controls is to ensure that implementation of major programs such as the ODCM, PCP, 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 ODCM, PCP, and major changes to the radioactive waste treatment system. This commitment meets the intent of NUREG-0473.

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 a satisfactory map of the site.

3.3 OFFSITE DOSE CALCULATION MANUAL (ODCM)

As specified in NUREG-0473, 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 defining the treatment paths and the components of the radioactive liquid, gaseous, and solid waste management systems. 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 effluent monitors, which ensures that the maximum permissible concentrations, as specified in 10CFR20, will not be exceeded by discharges from various liquid or gaseous release points. To augment conservatism in the case of simultaneous releases, the Licensee has introduced a conservative factor of 10 for liquid effluent setpoint calcula-

tions. The Licensee, however, has not provided a method to calculate gaseous effluent setpoints.

The Licensee demonstrated the method of calculating the radioactive liquid concentration by describing in the ODCM the means of collecting and 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 main stack and the exhaust vents from Units 2 and 3; the release from the main stack is treated as elevated level, whereas those from the exhaust vents are at the mixed level. In all cases, 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 elevated releases from the main stack, the Licensee has also considered the direct exposure constant (B) from exposure to the finite plume. The Licensee intends to use the maximally exposed individual and the critical organ as the reference receptor. The Licensee has demonstrated that the described methods and relevant parameters have followed the conservative approach provided by NUREG-0133 and Regulatory Guide 1.109. However, since the Licensee has not included iodine-133 in the sampling analysis program, a statement should be added to record the method to account for iodine-133 in the dose rate calculation. Also, for dose rate calculations, the Licensee should consider the predominant pathway from inhalation rather than the ingestion pathways from ground-plane deposition. In addition, the validity of using the Licensee's code (MARE) to calculating the exposure constant (B) needs to be substantiated.

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

For liquid releases, the Licensee has identified fish and drinking water consumption as the two viable pathways. In the calculation, the Licensee has

used near-field and far-field dilution factors 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 calculation, the Licensee has used the maximally exposed individual as the reference receptor. However, the Licensee has not included the drinking water pathway in deriving the dose factors as shown in Table II.A.1 of the proposed ODCM. Furthermore, the Licensee has not provided a method to project the monthly dose as needed to determine the operation of the radwaste treatment system.

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 food and ground-plane pathways, as well as the exposure constant (V) for the gamma radiation from the elevated finite plume, which is consistent with the methodology of NUREG-0133. As in the case for dose rate calculation, the Licensee should also record the method used to account for iodine-133 in the dose calculation. Also, the Licensee should provide background documents to validate the use of the company code (MARE) to arrive at the exposure constant (V).

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

The Licensee has not provided diagrams defining the effluent paths and components of the radioactive liquid and gaseous waste treatment systems, in

which the radiation monitors specified in the Licensee-submitted RETS are also to be properly identified.

The Licensee has provided a description of sampling locations in the ODCM and has identified them in Table VI.A.1 and also in Figures VI.A.3 through VII.A.3 of that document. This description is consistent with the sampling locations specified in the Licensee's RETS Table 3.12.1-1 on environmental monitoring, except that the Licensee has not designated a scale for Figures VI.A.1 through VI.A.3.

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 for the following deficiencies:

1. The Licensee has not addressed the following sections:

   - o The monthly dose projection for the purpose of operating the liquid radwaste treatment system.
   - o Gaseous release setpoint calculations.
   - o Effluent flow diagram(s) for liquid and gaseous radwaste system and effluent controls.

2. The Licensee has not incorporated the drinking water pathway into the dose factor calculation (Table II.A.1 in the ODCM submittal), although the drinking water pathway has been identified as a viable pathway (Table 4.8.3.a of the RETS submittal).

3. The Licensee has not provided supporting documentation to validate the use of its proprietary code (MARE) for calculating the dose contribution of the finite plume from the elevated stack release.

4. The Licensee has not included iodine-133 in the gaseous dose and dose rate calculations.

5. The Licensee has not identified and used the inhalation pathway as the major pathway for dose rate calculation from iodines and particulates.

6. The Licensee has not provided an isotopic analysis method for gaseous dose calculation, as in the case for the liquid dose calculation.

7. The Licensee has not identified specific pathways (mile, vegetation, etc.) for iodine and particulate dose calculation.

8. The Licensee has not designated a scale for Figures VI.A.1, VI.A.2, and VI.A.3 for environmental monitoring sample locations.

4. CONCLUSIONS

Table 1 summarizes the results of the final review and evaluation of the submittal for the Peach Bottom Atomic Power Station Units 2 and 3 proposed Radiological Effluent Technical Specifications (RETS). The following conclusions have been reached:

1. The Licensee's proposed Radiological Effluent Technical Specifications (RETS) submitted November 29, 1982 meet the intent of NUREG-0473, "Radiological Effluent Technical Specifications."

2. The Licensee's Offsite Dose Calculation Manual (ODCM) submitted on November 29, 1982 uses documented and approved methods and is consistent with the criteria of NUREG-0133, and therefore is an acceptable reference except for the deficiencies listed in Section 3.3.1 of this TER.

Table 1. Evaluation of Proposed Radiological Effluent Technical Specifications (RETS), Peach Bottom Atomic Power Station Units 2 and 3

RETS Requirement	Technical Specifications: NRC Staff Model RETS NUREG-0473 (Section)	Technical Specifications: Licensee Proposal (Section)	Technical Specifications: Replaces or Updates Existing Tech. Spec. (Section)	Evaluation
Effluent Instrumentation	3/4.3.3.10, 3/4.3.3.11	3/4.8.B.3, 3/4.8.C.4	3/4.8.B.4, 3/4.8.C.1 3/4.8.C.5 3/4.8.C.6 3/4.8.C.7 3/4.8.C.8	Meets the intent of NRC criteria
Radioactive Effluent Concentrations	3/4.11.1.1, 3/4.11.2.1	3/4.8.B.1, 3/4.8.C.1	3/4.8.B.1, 3/4.8.B.3 3/4.8.C.1, 3/4.8.C.2	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	3/4.8.B.2, 3/4.8.C.2, 3/4.8.C.3, 3/4.8.D	3/4.8.B.2, 3/4.8.B.7 3/4.8.C.3, 3/4.8.C.4	Meets the intent of NRC criteria
Effluent Treatment	3/4.11.1.3, 3/4.11.2.4	3/4.8.B.4, 3/4.8.C.5	3/4.8.B.5, 3/4.8.C.9	Meets the intent of NRC criteria
Radioactivity Inventory Limits	3/4.11.1.4, 3/4.11.2.6	3/4.8.C.7	3/4.8.B.6, 3/4.8.C.5	Meets the intent of NRC criteria
Explosive Gas Mixtures	3/4.11.2.5	3/4.8.C.6	3/4.8.C.10	Meets the intent of NRC criteria
Solid Radioactive Waste	3/4.11.3	3/4.8.F	Not addressed	Meets the intent of NRC criteria
Environmental Monitoring	3/4.12.1	3/4.8.E	6.4 (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	Meets the intent of NRC criteria
Procedures and Records	6.8, 6.10	6.8, 6.10	6.8, 6.10	Meets the intent of NRC criteria
Reports	6.9.1.11, 6.9.1.12, 6.9.2	6.9.2, 6.9.3	6.9.2, 6.9.3	Meets the intent of NRC criteria
Implementation of Major Programs	6.13, 6.14, 6.15	6.17, 6.18	Not addressed	Meets the intent of NRC criteria

5. REFERENCES

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

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 Pressurized Water Reactors," Rev. 2
NRC, July 1979
NUREG-0472

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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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
NRC, September 1982
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13. W. Meinke (NRC)
Memo to M. Strum (Yankee Atomic Electric Company)
Subject: BWR-Specific Changes for NUREG-0472/3, Rev. 3
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14. E. J. Bradley (PECO)
Letter to H. R. Denton (NRC)
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15. "Comparison of Specification NUREG-0473, Radiological Effluent Technical Specifications for BWRs, vs. Licensee Submittal of Radiological Effluent Technical Specifications for Peach Bottom Atomic Power Station Units 2 and 3" (Draft)
Franklin Research Center, June 1, 1983

16. Technical Review of Offsite Dose Calculation Manual for Peach Bottom Atomic Power Station Units 2 and 3 (Draft)
Franklin Research Center, June 1, 1983

17. Franklin Research Center
Letter of Transmittal to NRC
Subject: Trip report on site visit to Peach Bottom Atomic Power Station Units 2 and 3
July 30, 1982

18. E. J. Bradley (PECO)
Letter to H. R. Denton (NRC)
Subject: RETS and ODCM Submittal
November 29, 1982

19. "Comparison of Specification NUREG-0473, Radiological Effluent Technical Specifications for BWRs, vs. Licensee Final Submittal, dated November 29, 1982, of Radiological Effluent Technical Specifications for Peach Bottom Atomic Power Station Units 2 and 3"
Franklin Research Center, June 29, 1983

20. W. Meinke (NRC)
Memo to S. Pandey (FRC)
Subject: NRC Resolution of RETS Review Questions
May 10, 1983

21. W. Meinke (NRC)
Memo to S. Pandey (FRC)
Subject: NRC Resolution of RETS Review Questions
June 13, 1983

22. C. Willis (NRC)
Letter to Dr. S. Pandey (FRC)
Subject: Changes to RETS requirements following meeting with Atomic Industrial Forum (AIF)
November 20, 1981

23. C. Willis (NRC)
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Subject: Control of explosive gas mixture in PWRs
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24. C. Willis and F. Congel (NRC)
"Status of NRC Radiological Effluent Technical Specification Activities"
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