

TECHNICAL EVALUATION REPORT  
**RADIOLOGICAL EFFLUENT TECHNICAL  
SPECIFICATION IMPLEMENTATION (A-2)**

BALTIMORE GAS AND ELECTRIC COMPANY  
CALVERT CLIFFS 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 Calvert Cliffs Nuclear Power Plant Units 1 and 2 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 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:

- o 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.
- o 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.
- o 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 [1] for pressurized water reactors (PWRs) 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 the 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 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 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 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 response to the NRC's request, the Licensee submitted a RETS proposal [13] on behalf of Calvert Cliffs Nuclear Power Plant Units 1 and 2, dated March 15, 1979. This proposal was followed at a later date by a submittal of the ODCM [14]. In the RETS submittal, the Licensee closely followed the model RETS format (NUREG-0472) for PWRs. Initial review of the Licensee's submittal was performed in November 1981 by an independent review team at Franklin Research Center (FRC). The Licensee's submittal was compared with the model RETS and assessed for compliance with the requirements as stipulated.

Copies of the draft review, dated December 11, 1981 [15], were delivered to the NRC and the Licensee prior to a site visit by the independent review team.

The site visit was conducted on January 25-26, 1982 by the reviewers with the participation of plant personnel and the NRC staff. Discussion focused on the initial review of the proposed changes to the RETS and on the technical approaches for an ODCM. The technical deficiencies in the Licensee's proposed RETS were considered, and deviations from NRC guidelines were pointed out.

Upon conclusion of this meeting, many of the differences were clarified and resolved; only a few items remained open, pending justification from the Licensee. These major issues are summarized in Reference 16. Subsequent to the site visit, the Licensee had provided justification [17] and a revised RETS proposal [18]. None of these, however, addressed the open issues discussed at the site visit.

On May 22, 1984, staff members of the Licensee and NRC met at the Calvert Cliffs plant. Discussion focused on differences between NRC guidance and the Licensee's existing positions on RETS. As a result of the meeting, resolution was achieved on all problems and open items.

Under a cover letter dated October 11, 1984 [19], Baltimore Gas and Electric Company delivered its final submittals on RETS, ODCM, and PCP to the NRC. Copies of these submittals were transmitted to FRC for review. The Licensee's RETS submittal was evaluated against NUREG-0472, Draft Revision 3 [12]. The ODCM was evaluated according to the existing guidelines specified by NUREG-0133. The PCP was reviewed against the NRC guidelines dated January 7, 1983 [20].

The review also incorporated the additional guidance that FRC received from the NRC staff on plant-specific issues [21]. Details of the RETS review were documented in the comparison copy [22].



## 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 of radioactivity 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 concentration 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 [23, 24], clarifications [25, 26], and branch positions [27, 28, 29, 30] 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 was based on the following NRC guidelines: Branch Technical Position, "General Content of the Offsite Dose Calculation Manual" [31]; NUREG-0133 [9]; and Regulatory Guide 1.109 [32]. The ODCM format is left to the licensee and may be simplified by tables and grid printouts.

Review of the PCP was based on the guidance provided by the NRC staff [20]. The NRC guidelines do not include new criteria required by 10CFR Part 61 [33], for which the NRC technical positions are being developed.

### 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 Calvert Cliffs Nuclear Power Plant Units 1 and 2, both of which are PWRs.

##### 3.1.1 Radioactive Liquid Effluent

The liquid radwaste system of Calvert Cliffs Units 1 and 2 consist mainly of the reactor coolant waste processing system (RCWPS) and the miscellaneous waste processing system (MWPS), as shown in Figure 1. Both units have independent, identical RCWPS and they share one MWPS. Effluents from both RCWPS are combined into one reactor coolant waste monitoring tank (RCWMT #12) and discharged in batches into the circulating water effluent line which leads to the Chesapeake Bay. Also connected to the circulating water line is the MWPS effluent line. These two waste streams constitute the liquid radwaste effluent.

Blowdown from the steam generator is also discharged to the bay via the circulating water discharge canal. Each unit has a separate blowdown effluent line connected to the circulating water.

Another effluent line coming from the turbine building sump is also discharged to the Chesapeake Bay.

##### 3.1.2 Radioactive Gaseous Effluent

Calvert Cliffs Units 1 and 2 share the same waste gas processing system (WGPS), as shown in Figure 2. The waste gas in the surge tank is discharged to one of the three waste gas decay tanks and, after being sampled, is released through the release header to the plant vents. The units have separate, but identical plant vent systems. Also discharged to the plant vent are the substreams from the auxiliary building ventilation, the auxiliary building equipment vents, the reactor containment, the steam generator blowdown tank vent, the condenser offgas, and the spent fuel pool. Monitors are located at the release header of the WGPS and at each of the plant vents.

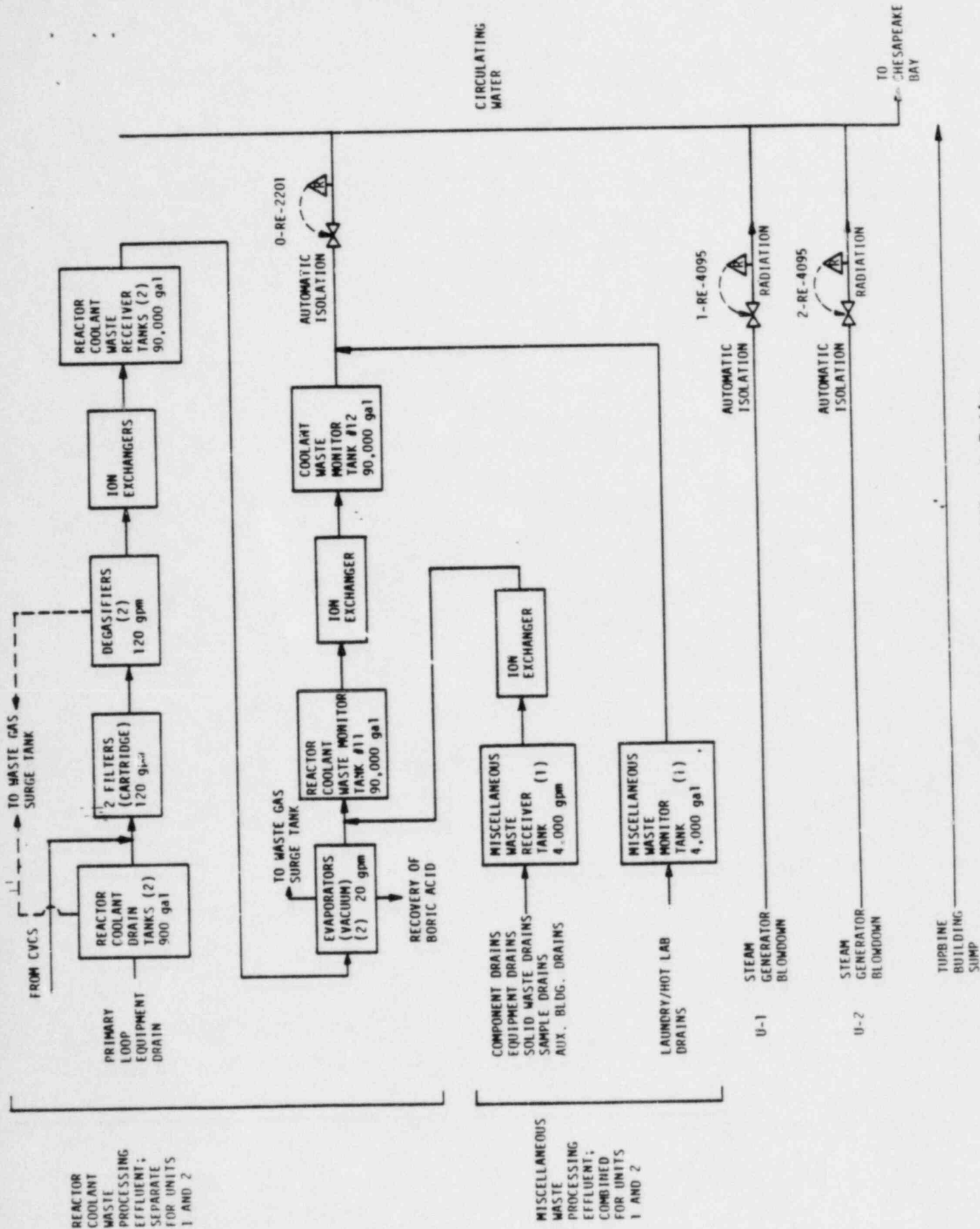


Figure 1. Liquid Radwaste Treatment Systems, Effluent Paths, and Controls, Calvert Cliffs Nuclear Power Plant Units 1 and 2

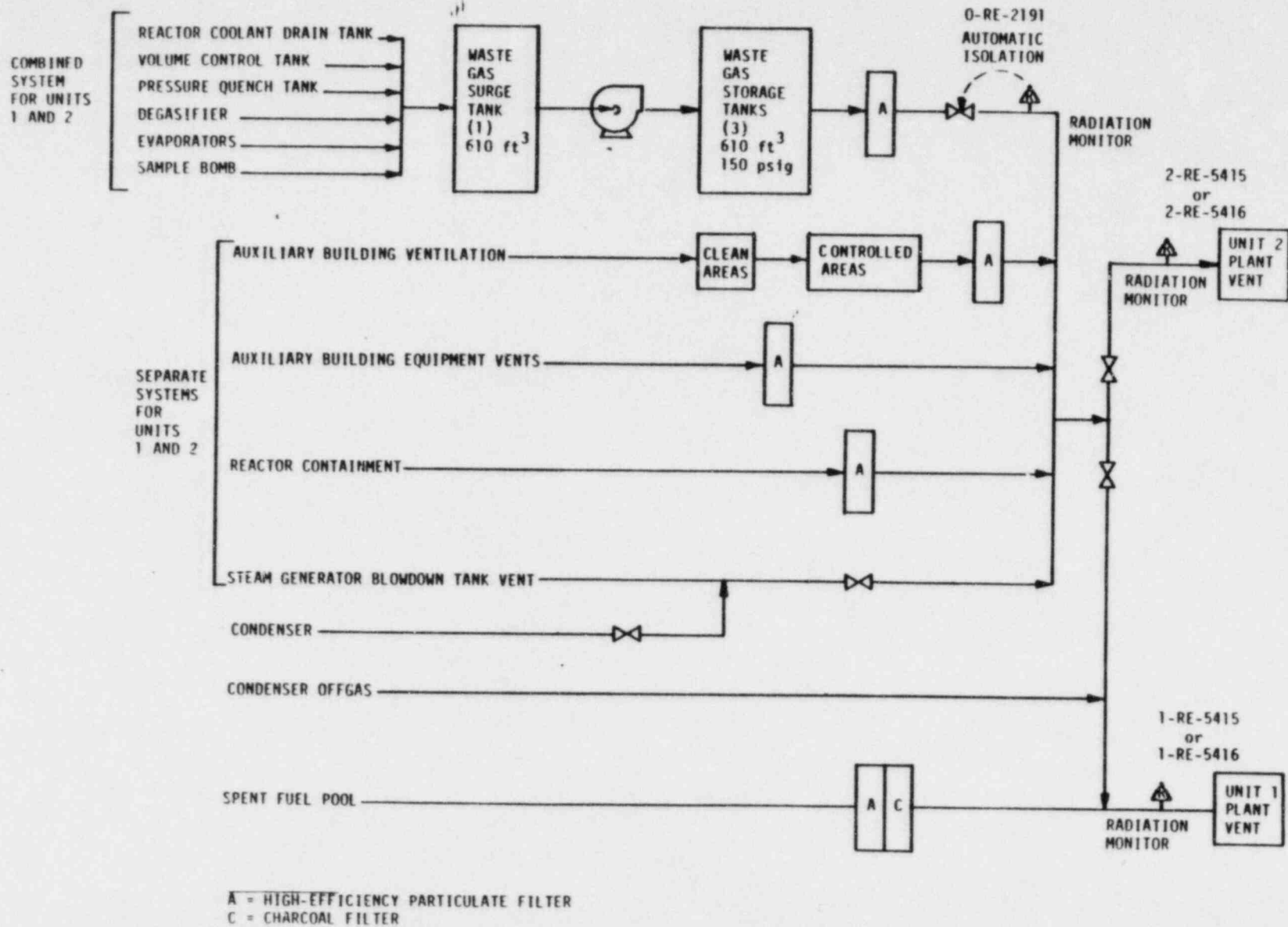


Figure 2. Gaseous Radwaste Treatment Systems, Effluents Paths, and Controls, Calvert Cliffs Nuclear Power Plant Units 1 and 2

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### 3.2 RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATIONS

The present evaluation of the Licensee's proposed RETS against the provisions of NUREG-0472 included the following: (1) a review of RETS information provided by the Licensee between 1979 and 1982 [13, 14, 17, 18], (2) a discussion of problem areas in that submittal by means of a site visit [16], and (3) a review of the Licensee's October 11, 1984 final RETS, ODCM, and PCP submittals [19].

#### 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 that alarm/trip setpoints be determined to ensure that radioactivity 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.

##### 3.2.1.1 Radioactive Liquid Effluent Monitoring Instrumentation

A radiation monitor (0-RE-2201) has been installed for the liquid effluent line (Figure 1) which receives effluent releases from the RCWPS and the MWPS. The monitor also has automatic isolation capabilities. The Licensee also has radiation monitors (1-RE-4095 and 2-RE-4095) for each of the steam generator blowdown for Units 1 and 2, respectively. These radiation monitors also have automatic isolation capability. The turbine building sump is not equipped with a radiation monitor. However, the Licensee has provided a sampling schedule for such effluents (Table 4.11-1 of the submittal), thus meeting the intent of NUREG-0472.

These existing monitoring capabilities provide adequate assurance that the provisions of NUREG-0472 for the radioactive liquid effluent monitoring instrumentation are met.



### 3.2.1.2 Radioactive Gaseous Effluent Monitoring Instrumentation

Each of the reactor units has a main vent system equipped with a redundant monitoring system (monitors 1-RE-5415/5416 for Unit 1 and 2-RE-5415/5416 for Unit 2) capable of monitoring noble gases, iodines, and particulates.

A noble gas monitor (0-RE-2191) equipped with automatic termination capability is installed at the waste gas holdup system.

These existing gaseous monitoring capabilities provided by the Licensee meet the intent of NUREG-0472 for radioactive gaseous effluent monitoring instrumentation.

### 3.2.2 Concentration and Dose Rates of Effluents

#### 3.2.2.1 Liquid Effluent Concentration

In Section 3.11.1.1 of the Licensee's submittal, a commitment is made to maintain the concentration of radioactive liquid effluents released to the unrestricted areas to within 10CFR20 limits, and if the concentration of liquid effluents exceeds these limits, the concentration will be restored without delay to within the MPC limits specified in 10CFR20. The Licensee's commitment does not include the dissolved or entrained noble gases; the Licensee explained that based on the historical effluent data the contribution of dissolved gases to total liquid effluent activity is considered insignificant. This is deemed to meet the intent of NUREG-0472 [21]. Both batch and continuous radioactive liquid effluent releases 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.

It was determined that the Licensee-proposed specification meets the intent of NUREG-0472.

#### 3.2.2.2 Gaseous Effluent Dose Rate

In Section 3.11.2.1 of the Licensee's submittal, a commitment is made to maintain the offsite gaseous dose rate from radioactive gaseous effluents to

areas at and beyond the site boundary to within 10CFR20 limits, or the equivalent dose rate values prescribed by Section 3.11.2.1 of NUREG-0472. If the dose rate of gaseous effluents exceeds these limits, it will be restored without delay to a value equal to within these limits. Although the Licensee has not included iodine-133 and tritium in the specification, the Licensee explained that the review of the historical plant data revealed that contributions from these two isotopes are insignificant. The Licensee maintains the commitment to report the data in the Semiannual Effluent Release Report as required by Regulatory Guide 1.21. This is considered as meeting the intent of NUREG-0472 [21].

The radioactive gaseous waste sampling and analysis program (Table 4.11-2 of the Licensee's submittal) provides adequate sampling and analysis of the vent discharges, including the substreams, 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 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 from the site to areas at and beyond the site boundary as specified in 10CFR50, Appendix I, Section II.B; (3) maintain the dose level at and beyond the site boundary from releases of iodine-131 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 all uranium fuel cycle sources of the plant to any member of the public to within the requirements of 40CFR190. In each pertinent section, the Licensee has made a commitment to perform dose calculations in accordance with methods given in the ODCM. Although the Licensee has not included iodine-133 and tritium in the gaseous dose specification (Specification 3.11.2.3 of the Licensee's submittal), the Licensee maintains the commitment to report the

data in the Semiannual Effluent Release Report as required by Regulatory Guide 1.21. This satisfies the intent of NUREG-0472.

The Licensee has an additional specification [3.11.2.3(c)] in the proposed submittal which states: "Less than 10% of the limits of 3.11.2.3(a) and (b) as a result of burning contaminated oil." This additional specification is not part of RETS, and was not included in this review.

#### 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.

In the proposed Specifications 3.11.1.3 and 3.11.2.4, 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 doses exceed the prescribed dose limits. These proposed dose limits are:

- a. Liquid radwaste treatment system. Proposed projected dose limits for both reactors of 0.36 mrem to the total body or 1.20 mrem to any organ in a 92-day period, instead of model RETS projected dose limits for each reactor 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 for both reactors of 1.20 mrad for gamma radiation and 2.4 mrad for beta radiation in a 92-day period, instead of model RETS projected air dose limits for each reactor of 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation when averaged over 31 days.
- c. Ventilation exhaust treatment system. Proposed projected dose limit for both reactors of 1.8 mrem to any organ in a 92-day period, instead of model RETS projected dose limits for each reactor of 0.3 mrem to any organ when averaged over 31 days.

The Licensee has also made a commitment to calculate the monthly doses at a frequency of at least once per 60 days rather than once per 31 days as specified by the model RETS.

These differences have been discussed by the Licensee and the NRC staff [21], and the submittal is considered to meet the intent of NUREG-0472 for the Calvert Cliffs plant.

### 3.2.5 Radioactivity 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 non-occupational exposure. The Licensee's outside tanks are seismic-qualified tanks and thus a specification is not needed for tank inventory. This meets the intent of NUREG-0472. For gas storage tanks, the Licensee has set a limit of 58,500 curies noble gas (considered as xenon-133). The Licensee's submittal regarding the radioactivity inventory limits thus meets 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 systems. The Licensee has stated that the waste gas holdup system is hydrogen-rich and is not designed to withstand a hydrogen/oxygen explosion.

In Specification 3.11.2.5 of the Licensee's submittal, a commitment is made to limit the concentration of oxygen in the waste gas holdup system to less than 4% by volume regardless of the concentration level of hydrogen. The Licensee has not provided monitors 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. These trigger levels are, however, less conservative than those specified by the model RETS.

As in the previous reviews of other plants, it is determined that the Licensee meets the intent of NUREG-0472 in the interim until the NRC completes its study of the explosive gas problem.



### 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. Specification 3.11.3 of NUREG-0472 provides for the establishment of a PCP to show compliance with this objective. The Licensee has made a commitment (Specification 3.11.3 of the submittal) to implement such a program in accordance with a PCP and thus to ensure that radwaste is properly processed and packaged before it is shipped to the burial site. This meets 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 an adequate and full-area-coverage monitoring program exists and that the 10CFR50, Appendix I requirements for technical specifications on environmental monitoring are satisfied. In all cases, the Licensee has followed NUREG-0472 guidelines, including the Branch Technical Position dated November 1979 [28], and has provided an adequate number (23) of thermoluminescent dosimeter (TLD) sample locations omitting water sectors not applicable to land pathways. 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 Annual Radiological Environmental Operating Report, which meets the intent of NUREG-0472. The specification for the land use census satisfies the provisions of Section 3.12.2 of NUREG-0472 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-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 Plant Operations and Safety Review Committee (POSRC) as the group responsible for review of the proposed changes to the process control program, the offsite dose calculation manual, and for review of the accidental and unplanned or uncontrolled radioactive releases. Audits are performed under the cognizance of the Off-Site Safety Review Committee (OSSRC); these audits encompass the radiological environmental monitoring program, the offsite dose calculation manual, the process control program, and the quality assurance program. It was determined that the Licensee-proposed administrative structure satisfactorily meets 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 specified in NUREG-0472 for implementing the ODCM and the PCP. 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 PCP and ODCM. The Licensee stated that the RETS monitoring program and their implemented procedures will be auditable and covered by the Licensee's quality assurance program. It was determined [21] that the Licensee meets the intent of NUREG-0472. The Licensee intends to retain the records of analyses required by the radiological environmental monitoring program that would permit evaluation of the accuracy of the analysis at a later date. This would include procedures effective at specified times and QA records showing that these procedures were followed. It is thus determined that the Licensee has met 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 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 6.9.1.7 of the Licensee's submittal, a commitment is made to provide an annual radiological environmental surveillance report that includes summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities. The report also includes the results of land use censuses, and participation in an interlaboratory comparison program specified by Specification 3.12.3 of the submittal.
2. Semiannual radioactive effluent release reports. In Section 6.9.1.8 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 and an assessment of offsite doses. Listings of new locations for dose calculations identified by the land use census as well as any changes to ODCM, PCP, and major changes to radioactive waste treatment systems are also included in the report.
3. Special report. The Licensee has made a commitment to file a 30-day special report to the NRC under the following conditions as prescribed by the proposed specifications:
  - o exceeding liquid effluent dose limits according to Specifications 3.11.1.2 and 3.11.1.3
  - o exceeding gaseous effluent dose limits according to Specifications 3.11.2.2, 3.11.2.3, and 3.11.2.4
  - o exceeding total dose limits according to Specification 3.11.4
  - o exceeding the reporting levels of Table 3.12-2 for the radioactivity measured in the environmental sampling medium.

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 ODCM, the PCP, and major changes to the radioactive waste treatment system follow appropriate administrative procedures. The Licensee has made a commitment to review, report, and implement major programs such as the ODCM, the PCP, and major changes to the radioactive waste treatment system. These commitments meet 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 system. 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 the 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. The Licensee has made a commitment to ensure that simultaneous gaseous releases from both U-1 and U-2 main vents do not exceed established dose limits at the site boundary.

The Licensee has 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 releases.

Methods are also included for showing that the air maximum permissible concentration (MPC) at or beyond the unrestricted areas due to noble gases, iodine-131, and radionuclides in particulate form with half-lives greater than 8 days are in compliance with 10CFR20. The exclusion of tritium has been agreed upon by the NRC staff due to the site-specific situation [21]. In all cases, the Licensee has used the highest annual average values of relative concentration (X/Q) of  $2.2 \times 10^{-6} \text{ sec/m}^3$  to determine the controlling locations. The Licensee's approach of using the MPC values meets the dose rate design objectives and the intent of NUREG-0133 on the requirement of 10CFR20.

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

For liquid releases, the Licensee has identified drinking water and fish consumption as the two viable pathways. In the calculation, the Licensee has used all key parameters follow the suggested values given in Regulatory Guide 1.109. The Licensee has used the maximally exposed adult individual as the reference receptor. 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 60 days. This frequency of calculation has been agreed upon by the NRC staff [21].

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 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 ground contamination pathway, for the leafy vegetable pathway

and the grass-cow-milk pathway for ingestion, for which the Licensee considered thyroid to be the critical organ for all age groups. This approach is consistent with the methodology of NUREG-0133.

Due to plant-specific reasons, the Licensee has not provided methods for monthly liquid and gaseous dose projections. The Licensee's alternative is to calculate the monthly doses once per 60 days for liquid and gaseous releases, respectively. This has been determined to meet the intent of NUREG-0472 [21].

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 Attachment 9 to the submission. This description is consistent with the sampling locations specified in the Licensee's 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 is therefore an acceptable reference.

#### 3.4 PROCESS CONTROL PROGRAM (PCP)

NUREG-0472 specifies that the Licensee develop a PCP to ensure that the processing and packaging of solid radioactive wastes will be accomplished in compliance with 10CFR20, 10CFR71, and other federal and state regulations or requirements governing the offsite disposal of the low-level radioactive waste.

The PCP is not intended to contain a set of detailed procedures; rather, it is the source of basic methodology for the detailed procedures to be developed by the Licensee. The criteria used for the PCP are to address only current NRC guidance, which does not include new criteria required by 10CFR Part 61.

### 3.4.1 Evaluation

The Licensee has made a commitment to process all liquid wet wastes prior to shipment offsite; has made a commitment to comply with federal regulations on shipping and packaging; has made a commitment to comply with burial ground requirements; and has provided general descriptions for laboratory mixing for deriving process parameters, process, and sampling for solidification. The Licensee, however, has not mentioned oily wastes; has not provided a sketch of the processing systems; and has not specifically made a commitment to address ALARA considerations.

In summary, it is concluded [21] that the Licensee's submittal generally complies with the current NRC criteria for PCP implementation and therefore is acceptable on an interim basis. The acceptability of this PCP is based on currently available guidelines, but a future revision should address compliance with 10CFR61 when revised guidance becomes available.



#### 4. CONCLUSIONS

Table 1 summarizes the results of the final review and evaluation of the RETS submittal for Calvert Cliffs Nuclear Power Plant Units 1 and 2. The evaluation was based on the Licensee's final submittal of the RETS, ODCM, and PCP [19].

The following conclusions were reached:

1. The Licensee's proposed RETS, submitted October 11, 1984, meets the intent of the NRC staff's "Standard Radiological Effluent Technical Specifications," NUREG-0472, for Calvert Cliffs Nuclear Power Plant Units 1 and 2.
2. The Licensee's ODCM, submitted October 11, 1984, uses documented and approved methods that are applicable to Calvert Cliffs Nuclear Power Plant Units 1 and 2 and are consistent with the criteria of NUREG-0133. It is thus an acceptable reference.
3. The Licensee's PCP, submitted October 11, 1984, complies with the current NRC criteria for implementing the PCP and is therefore acceptable until revised PCP guidance becomes available.



Table 1. Evaluation of Proposed Radiological Effluent Technical Specifications (RETS), Calvert Cliffs Nuclear Power Plant Units 1 and 2

	<u>Technical Specifications</u>		<u>Replaces or Updates Existing Tech. Specs. (Section)</u>	<u>Evaluation</u>
	<u>NRC Staff Std. RETS NUREG-0472 (Section)*</u>	<u>Licensee Proposal (Section)</u>		
Effluent Instrumentation	3/4.3.3.3.10 3/4.3.3.3.11	3.3.3.8 3.3.3.9	3/4.3.3	Meets the intent of NRC criteria
Radioactive Effluent Concentrations	3/4.11.1.1 3/4.11.2.1	3.11.1.1 3.11.2.1	To be added to Appendix A	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	3.11.1.2 3.11.2.2 3.11.2.3 3.11.4	3/4.4.8	Meets the intent of NRC criteria -
Effluent Treatment	3/4.11.1.3 3/4.11.2.4	3.11.1.3 3.11.2.4	To be added to Appendix A	Meets the intent of NRC criteria
Radiocactivity Inventory Limits	3/4.11.1.4 3/4.11.2.6	NA 3.11.2.6	To be added to Appendix A	Meets the intent of NRC criteria
Explosive Gas Mixtures	3/4.11.2.5B	3.11.2.5		Meets the intent of NRC criteria on an interim basis
Solid Radioactive Waste	3/4.11.3	3.11.3	To be added to Appendix A	Meets the intent of NRC criteria
Environmental Monitoring	3/4.12.1	3.12.1	To be added to Appendix A	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	6.9	6.9	Meets the intent of NRC criteria
Implementation of Major Programs	6.13, 6.14, 6.15	6.16, 6.17, 6.18	To be added to Appendix A	Meets the intent of NRC criteria

\*Section number sequence is according to NUREG-0472, Rev. 3, Draft 7\* [12].

## 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  
NUREG-0133
10. C. Willis and F. Congel (NRC)  
"Summary of Draft Contractor Guidance of RETS"  
Presented at the AIF Environmental Subcommittee Meeting, Washington, DC  
May 19, 1982
11. F. Congel (NRC)  
Memo to RAB Staff (NRC)  
Subject: Interim Changes in the Model Radiological Effluent Technical Specifications (RETS)  
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  
NUREG-0472
13. Radiological Effluent Technical Specification, Calvert Cliffs Nuclear Power Plant Units 1 and 2  
Baltimore Gas and Electric Company  
March 15, 1979  
NRC Docket Nos. 50-317, 50-318
14. Offsite Dose Calculation Manual  
Calvert Cliffs Nuclear Power Plant Units 1 and 2  
Baltimore Gas and Electric Company  
Undated  
NRC Docket Nos. 50-317, 50-318
15. "Comparison of Specification NUREG-0472, Radiological Effluent Technical Specifications for PWRs vs. Licensee Submittal of Radiological Effluent Technical Specifications" (Draft)  
Franklin Research Center, December 11, 1981
16. Letter of Transmittal  
Subject: Trip Report on Site Visit to Calvert Cliffs Nuclear Power Station (January 25-26, 1982)  
Franklin Research Center
17. Letter of Transmittal from Dr. A. Rafi (BG&E) to Dr. S. Chen (FRC)  
Subject: Justification for Deviations in Calvert Cliffs Unit 1 and 2 RETS Submittal  
March 8, 1982
18. Radiological Effluent Technical Specifications (RETS), Calvert Cliffs Nuclear Power Plant Units 1 and 2  
April 23, 1982  
NRC Docket Nos. 50-317, 50-318
19. A. E. Lundvall-(Baltimore Gas and Electric)  
Letter of Transmittal to NRC  
Subject: Calvert Cliffs Nuclear Power Plant - Request for Amendment  
October 11, 1984  
NRC Docket Nos. 50-317, 50-318
20. C. Willis (NRC)  
Letter to S. Pandey (FRC)  
Subject: Criteria for Process Control Program  
January 7, 1983

21. W. Meinke (NRC)  
Memo to S. Pandey (FRC)  
Subject: Resolution of Discrepancies in RETS Submittal of October 11, 1984, for Calvert Cliffs Nuclear Power Plant  
November 7, 1984
22. "Comparison of Specification NUREG-0472, Radiological Effluent Technical Specifications for PWRs, vs. Licensee Final Submittal, dated October 11, 1984, of Radiological Effluent Technical Specifications for Calvert Cliffs Plant"  
Franklin Research Center, November 1984
23. C. Willis (NRC)  
Letter to S. Pandey (FRC)  
Subject: Changes to RETS requirements following meeting with Atomic Industrial Forum (AIF)  
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24. C. Willis (NRC)  
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25. C. Willis and F. Congel (NRC)  
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Washington, D.C.  
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26. C. Willis (NRC)  
Memo to P. C. Wagner (NRC)  
"Plan for Implementation of RETS for Operating Reactors"  
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27. W. P. Gammill (NRC)  
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October 7, 1981
28. "An Acceptable Radiological Environmental Monitoring Program"  
Radiological Assessment Branch Technical Position, Revision 1  
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29. W. P. Gammill and F. J. Congel (NRC)  
Memo to ETSB/RAB (NRC)  
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30. Methods for Demonstrating LWR Compliance with the EPA Uranium Fuel Cycle Standard (40CFR190)  
NRC, February 1980  
NUREG-0543
31. "General Contents of the Offsite Dose Calculation Manual," Revision 1  
Branch Technical Position, Radiological Assessment Branch  
NRC, February 8, 1979
32. "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I"  
NRC, October 1977  
Regulatory Guide 1.109, Rev. 1
33. Title 10, Code of Federal Regulations, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."