TECHNICAL EVALUATION REPORT

RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATION IMPLEMENTATION (A-2)

VIRGINIA ELECTRIC POWER COMPANY

NORTH ANNA POWER 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 North Anna Power Station 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:

- 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, operation 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], Virginia Electric and Power Company (VEPCO), the Licensee for North Anna Units 1 and 2, submitted information for 10CFR50, Appendix I Evaluation, dated June 4, 1976 [13].

The RETS was addressed in the next submittal by the Licensee, dated March 6, 1979 [14]. The submittal was a response to the November 15-16, 1978 NRC request and followed the format of NUREG-0472 for PWRs. On June 28, 1979, the Licensee submitted the ODCM [15], which had been reviewed and approved by the North Anna Chairman of Station Nuclear Safety and Operating Committee. On March 8, 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 [16] which were given to each operating reactor (OR) as guidelines for preparing the RETS and the ODCM. The Licensee's RETS submittal was assessed for compliance with the requirements of 10CFR50, Appendix I, and the "General Design Criteria," 10CFR50, Appendix A.

Copies of the draft review dated April 26, 1982 [17, 18] were delivered to the NRC and to the Licensee prior to a site visit to the VEPCO corporate

office in Richmond, VA. The purpose of the prearranged site visit was to resolve questions raised in the draft reviews.

The site visit was conducted on May 12-14, 1982. Discussions were held with VEPCO and North Anna Station personnel to review the RETS and ODCM reports. Two open items remained to be resolved. The remaining questions or "open items" were agreed upon, at which time the Licensee made a commitment to resubmit drafts of the RETS and ODCM by August 15, 1982. A trip report, dated July 6, 1982 [19], which covered the site visit to North Anna Power Station, was prepared and delivered to the NRC. The report included the resolutions reached, as well as "open items" to be resolved by the NRC with the Licensee.

On September 22, 1982, revised draft copies [20] of the Licensee's RETS and ODCM were reviewed by the FRC review team. Comments on the draft RETS were supplied to the NRC on October 13, 1982 [21]; the evaluation was based on the draft model RETS, NUREG-0472, Revision 3 [12]. An evaluation of the ODCM submittal of September 22, 1982 was conducted, and eight points of clarification to the submittal were delivered to the NRC on October 20, 1982 [22]. On November 9, 1982, a conference call was held between VEPCO and FRC [23]; this call was sanctioned by the NRC in order for the Licensee to resolve ODCM questions directly with the reviewer. All points of clarification were discussed and agreed upon by the Licensee. The recommended changes were to be incorporated in the resubmittal, targeted for November 30, 1982.

Under a cover letter dated December 17, 1982, VEPCO delivered their final proposed RETS, ODCM, and PCP [24] to the NRC. Copies of these submittals were delivered to FRC on December 22, 1982. The Licensee's RETS submittal was reviewed against NUREG-0472 [12]. The ODCM was also evaluated according to the existing guidelines specified by NUREG-0133 [9]. The PCP was reviewed against NRC guidelines dated January 7, 1983 [25]. The review also incorporated the additional guidance FRC received from the NRC staff on plant-specific issues [26].

Details of the RETS review are documented in the comparison copy [27].

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 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. Waste gas concentrations 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 [28, 29], clarifications [30, 31], and branch positions [32, 33, 34] 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.

The review of the ODCM was based on the following NRC guidelines: Branch Technical Position, "General Content of the Offsite Dose Calculation Manual" [16]; NUREG-0133 [9]; and Regulatory Guide 1.109 [35]. 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 North Anna Power Station Units 1 and 2; both are PWRs.

3.1.1 Radioactive Liquid Effluent

The liquid waste treatment system for the North Anna plant is common to both Units 1 and 2 (Figure 1). The liquid waste is primarily collected in high- and low-level waste drain tanks. This includes chemical and volume control, vent and drain sumps, spent resin flush, and hot laboratory drains for high-level waste; and vent and drain sumps, boron recovery test tanks, and fluid water treatment for low-level waste. All liquid waste is dumped into clarifier equipment which separates, through flat bed filters, the solid waste. The liquid radwaste effluent is then passed through demineralizers and then to the discharge tunnel. The liquid radwaste effluent line is monitored by LW-111, which provides alarm and automatic termination capability. The service water effluent line is monitored by SW-108. These two effluents lines, together with the condenser circulating water, lead to the circulating water discharge tunnel where monitors (SW-130, SW-230) are installed to monitor the liquid effluents before discharging into Lake Anna. The turbine building (floor drain) sump effluents are released directly to the station storm drain system; however, the Licensee does not provide on-line monitoring for this effluent line.

3.1.2 Radioactive Gaseous Effluent

The gaseous waste treatment system for the North Anna plant is also common to both Units 1 and 2 (Figure 2).

The process effluent from the recombiner is stored in the decay tank, where the effluents are released together with other streams into the process vent where releases are considered as mixed mode. The process vent has monitors GW-101 and GW-102 which have capabilities to automatically isolate

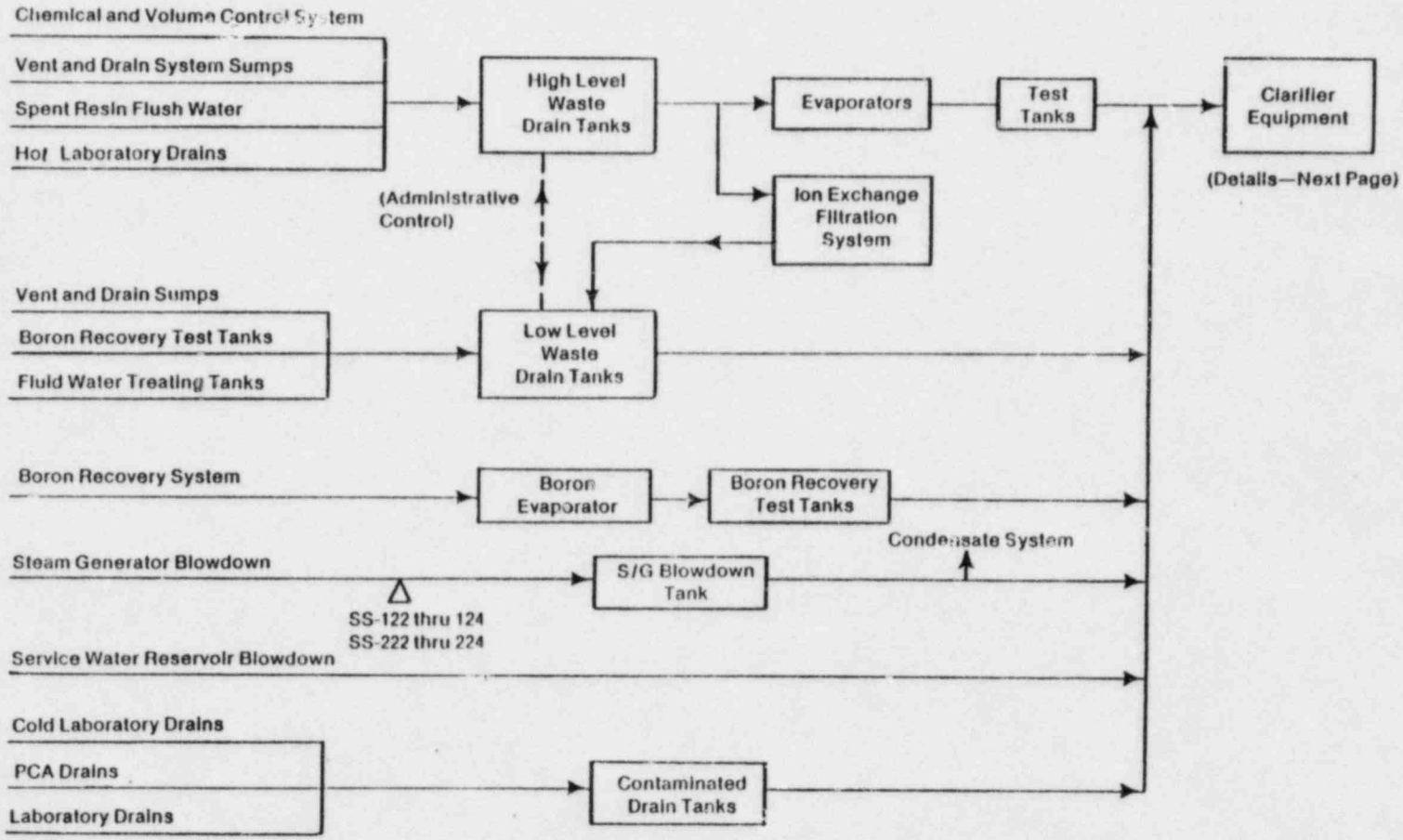

Figure 1. Liquid Radwaste Treatment Systems, Effluent Paths, and Controls for North Anna Power Station Units 1 and 2

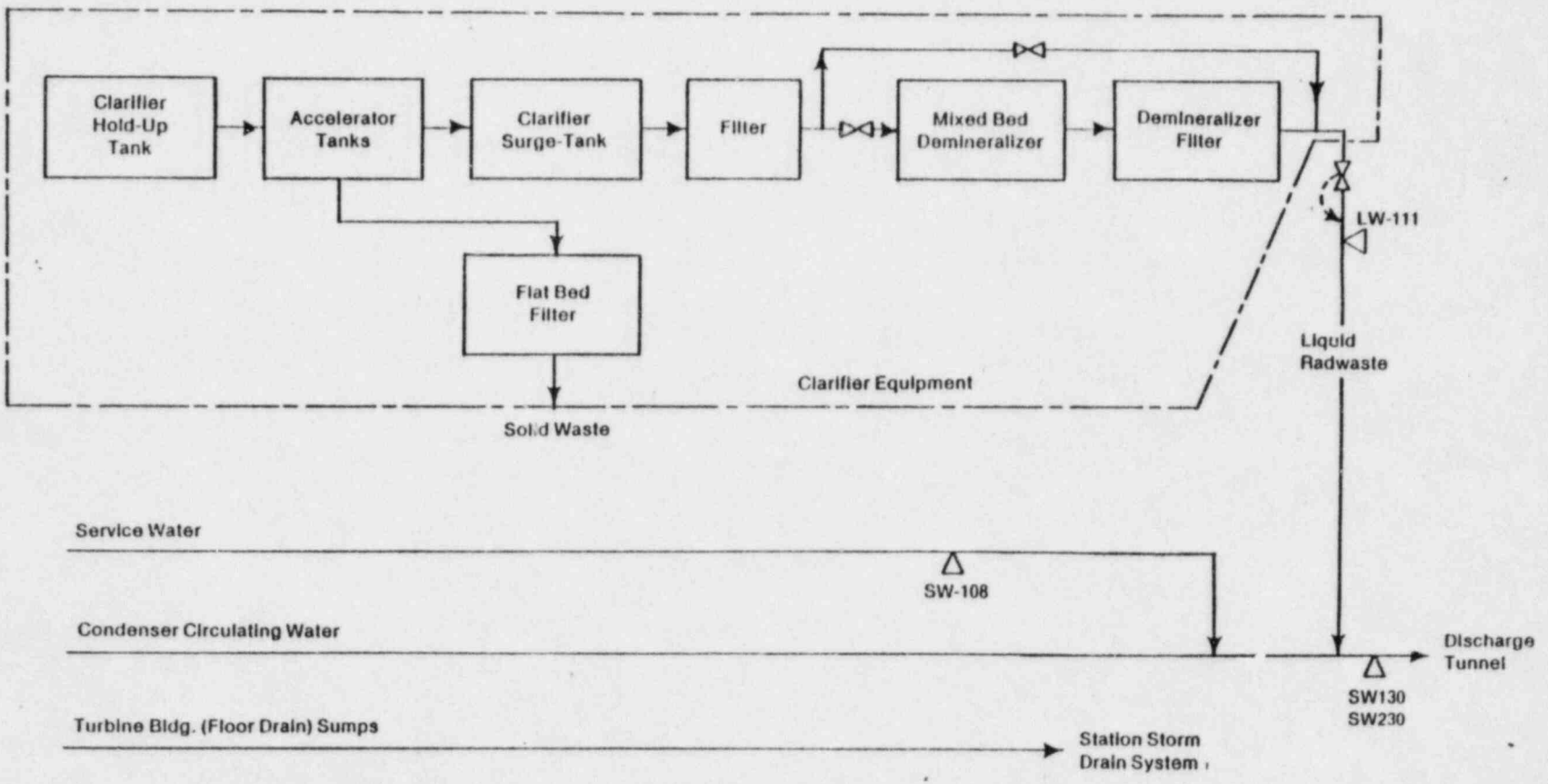

Figure 1 (Cont.)

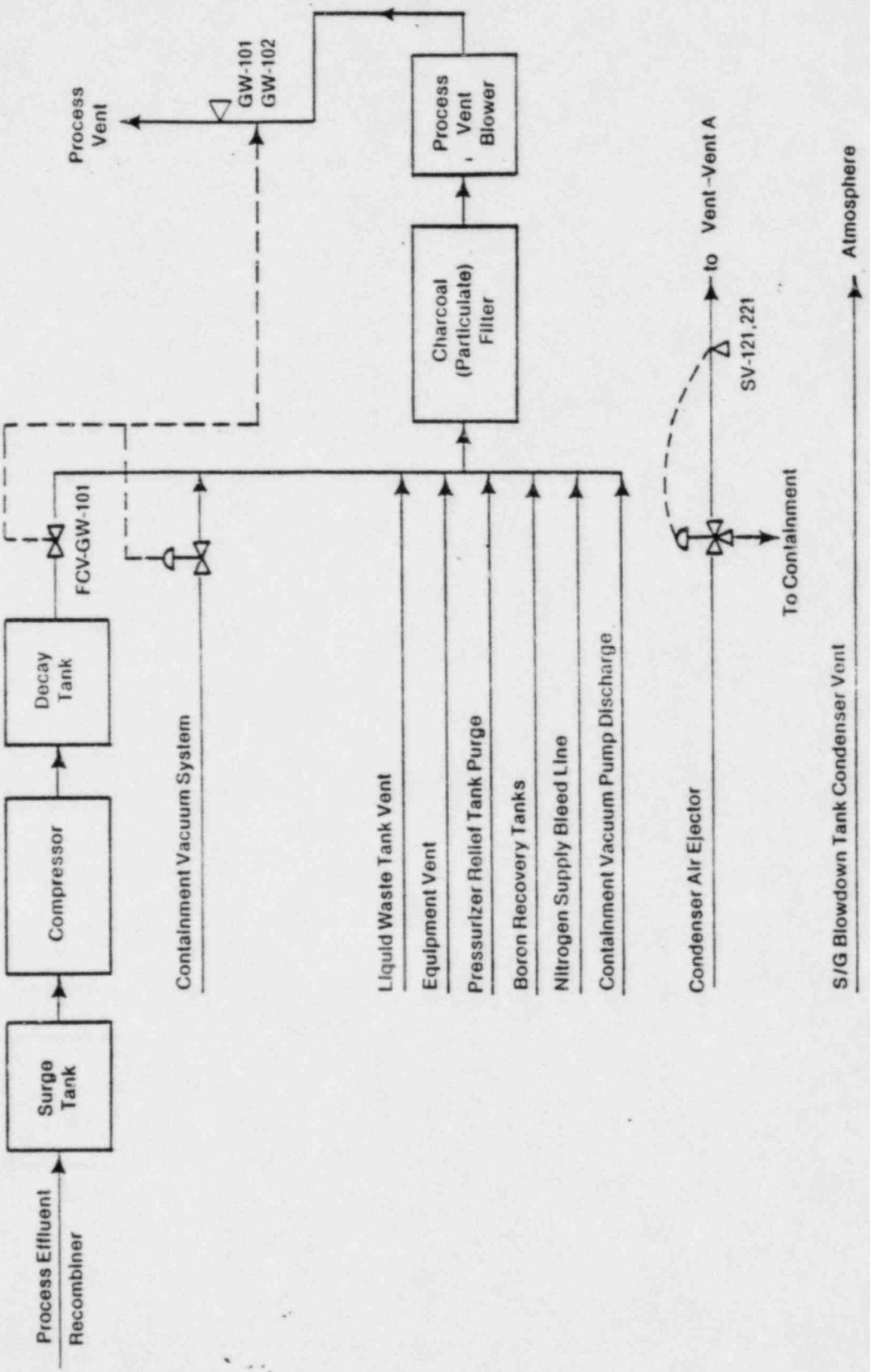

Figure 2. Gaseous Radwaste Treatment Systems, Effluents Paths, and Controls for North Anna Power Station Units 1 and 2

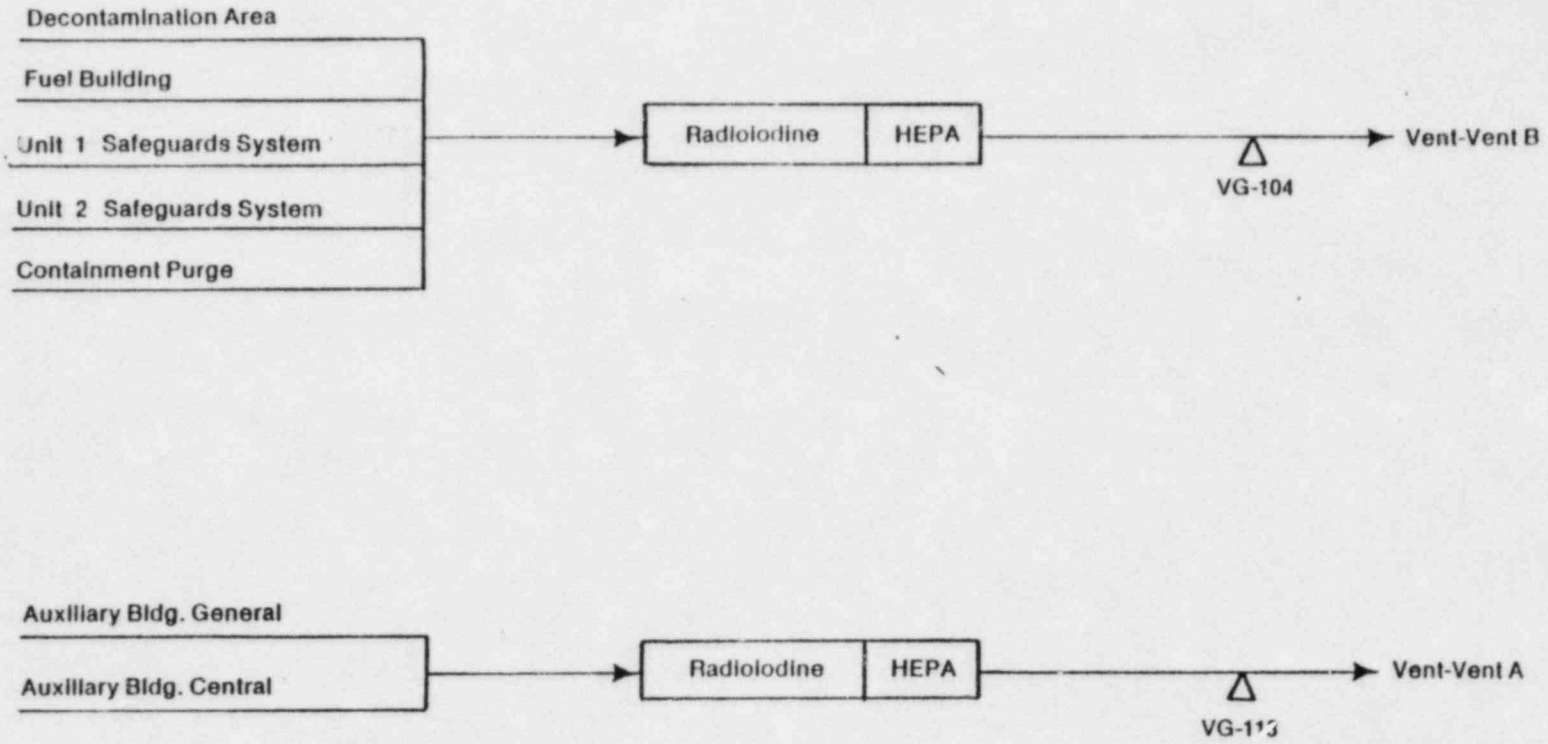

Figure 2 (Cont.)

the effluent releases from the decay tanks and the containment vacuum system, respectively.

The vent-vent system consists of two effluent lines. Vent-vent A is monitored by VG-113 and services the auxiliary building only, whereas vent-vent B is monitored by VG-104 and services the decontamination area, fuel building, and containment purge system. Releases from the vent-vent system are considered as ground level. The condenser air ejector line, which is monitored by SV-121 and SV-221, discharges gaseous effluents through vent-vent A. These two monitors are also capable of automatically isolating the releases from the the condenser air ejector.

The steam generator blowdown (SGB) vent condenser condenses iodine-131 in the steam which is returned to the SGB stream for discharge through the clarifiers. Surveillance of the steam generator blowdown vent system is maintained by a grab sample program described in the Licensee's proposed RETS, Table 4.11-2, Radioactive Sampling and Analysis Program.

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 [14]
- resolution of problem areas in that submittal by means of a site visit [19]
- review of the Licensee's September 16, 1982 draft submittal [20]
- review of the Licensee's December 17, 1982 final submittal [24].

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. 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.

The Licensee has provided radiation monitors for potential liquid or gaseous effluent lines. In addition, automatic isolation is provided for major effluent lines such as the liquid radwaste effluent and the gaseous waste decay tank effluent.

Although the Licensee does not monitor the turbine building liquid effluents, a commitment has been made to sample and analyze the turbine building sump if the activity of the secondary coolant exceeds 1×10^{-5} μCi/ml. The Licensee has established an ongoing sampling and analysis program for the batch release tanks as well as for continuous releases, as described in the Licensee's final submittal.

Since the effluents from the steam generator blowdown are not vented directly to the atmosphere, the alternative provided by the sampling program satisfies the alternative provisions discussed in NUREG-0133 for the steam generator blowdown vent. The Licensee has also established a sampling and analysis program for effluents released from the waste gas storage tank, containment purge, process vent, vent-vent system, condenser air ejector, and the steam generator blowdown.

The Licensee's proposed RETS submittal on liquid and gaseous effluent monitoring instrumentation has satisfied the provisions set forth in the model RETS and thus meets the intent of NUREG-0472.

3.2.2 Concentration and Dose Rates of Effluents

3.2.2.1 Liquid Effluent Concentration

In Section 3.11.1.1 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. Both batch and continuous 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.

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 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 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, 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 (1) meet the quarterly and yearly dose limitations for liquid effluents, per Section 3.11.1.2 [1]; (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 to the maximally exposed 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; and (4) limit the annual dose to the maximally exposed member of the public due to releases of radioactivity and radiation from uranium fuel cycle sources to within the requirements of 40CFR190. 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. The Licensee has made a commitment to use the liquid and gaseous radwaste treatment system when the projected doses averaged over 31 days exceed 25% of the annual dose design objectives, prorated monthly. The Licensee has also made a commitment to use the ventilation exhaust treatment system if the monthly projected dose exceeds the limits prescribed in NUREG-0472. This meets the intent of 10CFR50, Appendix I, Section II.D. The Licensee has also made a commitment to project the monthly dose in accordance with the ODCM. This also 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 non-occupational exposure. The Licensee has put a curie limit of 10 curies on all outside liquid tanks listed in the specifications and has made a commitment to perform surveillance according to the provisions of NUREG-0472. This limit excludes tritium and dissolved or entrained noble gases. For gas storage tanks, a curie limit of 25,000 curies has been set for noble gases which are considered to be represented by xenon-133. The Licensee's commitment to comply with tank inventory limits has satisfied the intent of NUREG-0472.

In addition to the proposed Specification 3.11.2.6, "Gas Storage Tanks," the Licensee submitted Attachment 3 to the proposed RETS [24], "Justification of Monthly Sampling of Waste Gas Decay Tanks," as a recommended change to Specification 4.11.2.6 surveillance requirements. The Licensee stated:

> "Based upon the justification presented in this report, it is recommended that the surveillance requirements for the Waste Gas Decay Tanks contained in the Radiological Effluent Technical Specifications (Section 4.11.2.6) be revised as follows: The quantity of radioactive material contained in the Waste Gas Decay Tank shall be determined to be within the above

limits (≤ 25,000 curies considered as Xe-133) at least once per month when the specific activity of the primary coolant is ≤ 1.0 μCi/g of DOSE EQUIVALENT I-131. Under conditions which result in the specific activity being greater than 1.0 μCi/g of DOSE EQUIVALENT I-131, the Waste Gas Storage Tanks shall be sampled once per 24 hours."

The statements made by the Licensee, including the calculations in Attachment 3, are satisfactory and meet 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. The Licensee has made a commitment to maintain a safe concentration in this system. Although the Licensee does not have the number of channels specified in the model RETS (a redundant hydrogen and oxygen monitor), the present system meets the intent on an interim basis according to the NRC branch position and was deemed acceptable at the site visit of March 11-12, 1982 [20].

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. The Licensee has made a commitment to establish a PCP, or the equivalent, to show compliance with this objective. The Licensee has provided assurance that 10CFR20 requirements will also be met, thereby satisfying 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 [33], and has provided an adequate number of sample locations for pathways identified.

The 36 thermoluminescent dosimeter (TLD) monitoring stations proposed by the Licensee satisfy the specification of NUREG-0472, which indicates no less than 40 monitoring stations for a full land coverage, because a portion of the area is underwater and cannot facilitate TLDs. 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 nuclear safety and operating committee (SNSOC) and the quality assurance department (QA) as the two groups responsible for reviews and audits, respectively. Their responsibilities also include the ODCM, PCP, and QA program. The two committees encompass the total responsibility for reviews and audits as specified in 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 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 in accordance with the provisions of NUREG-0472. The Licensee intends to retain the records of the radiological environmental monitoring program, as well as the records of quality assurance activities for the duration of the facility operating license. 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 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 6.9.1.11 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 interlaboratory comparison program specified by Specification 3.12.3 of NUREG-0472.

2. Semiannual radioactive and solid waste release reports. In Section 6.9.1.12 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, 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 4.12-2 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 PCP, ODCM, 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 PCP, ODCM, and major changes to the radioactive waste treatment system. This commitment 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 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. 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. To ensure that the MPC, as specified in 10CFR20, will not be exceeded even in the case of simultaneous discharge, the Licensee will adjust the setpoints according to the apportionment of the radioactivity released from each perspective effluent line.

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 dose rates at or beyond the site boundary due to noble gases, iodine-131, tritium, and radionuclides in particulate form with half-lives greater than 8 days are in compliance with 10CFR20. In this calculation, the Licensee has considered effluent releases from the process vent and the vent-vents (A and B); releases from the process vent are treated as mixed mode, and releases from the vent-vents are treated as ground 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. The Licensee intends to use the maximally exposed individual and the critical organ as the reference receptor. For noble gases, the Licensee has considered the total body dose and the skin dose resulting from gamma and beta radiation, respectively. For iodine-131, tritium, and particulates, the Licensee has considered the inhalation pathway for estimating the doses. The Licensee has demonstrated that the described methods and relevant parameters have followed the conservative approaches provided by NUREG-0133 and Regulatory Guide 1.109.

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 a near-field dilution factor specific to the plant; all other 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. 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 grass-cow-milk pathway for ingestion, for which the Licensee considered the infant to be the critical age group and thyroid to be the critical organ. This approach is consistent with the methodology of NUREG-0133.

Using the existing methodology for gaseous and liquid dose calculations, the Licensee has demonstrated a procedure to project the monthly dose and to ensure that the design objectives for the liquid radwaste system and the gaseous radwaste 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 Section 13 of that document. This description is consistent with the sampling locations specified in the Licensee's RETS Table 4.12-1 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.

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 criteria for the detailed procedures to be developed by the Licensee. The criteria used for the PCP are to address only today's requirements. The uncertainty about PCP requirements results from the recent promulgation of 10CFR61, "Licensing Requirements for Land Disposal of Radioactive Waste." The NRC staff's technical positions are presently being developed by the Division of Waste Management [25].

3.4.1 Evaluation

The Licensee has made a commitment to process all liquid wet wastes prior to shipment offsite; has provided general descriptions for laboratory mixing for deriving process parameters, and sampling for solidification; and has referenced plant and contractor procedures for verifying the absence of free liquid in containers. The Licensee has also made a commitment to follow plant procedures and exercise controls in keeping the doses ALARA. These commitments satisfy the intent of the NRC Guidelines [25].

In summary, it is concluded that the Licensee complies with the NRC criteria for PCP implementation except for oily wastes for which the Licensee

did not provide a description of the method for treatment. The Licensee has made a commitment to establish technical specifications for radwaste processing and packaging consistent with NRC guidelines.

4. CONCLUSIONS

The Licensee submitted the same Radiological Effluent Technical Specifications (RETS), Offsite Dose Calculation Manual (ODCM), and Process Control Program (PCP) for both Units 1 and 2 of North Anna Nuclear Power Station. Table 1 summarizes the results of the final review and evaluation of the RETS submittal. Comments apply equally to Units 1 and 2.

The following conclusions were reached:

1. The Licensee's proposed RETS, submitted December 17, 1982, meets the intent of the NRC staff's "Standard Radiological Effluent Technical Specifications," NUREG-0472, for North Anna Power Station Units 1 and 2.

2. The Licensee's ODCM, submitted December 17, 1982, uses documented and approved methods that are applicable to North Anna Power Station Units 1 and 2 and are consistent with the criteria of NUREG-0133.

3. The Licensee's PCP, submitted December 17, 1982 and evaluated against NRC Guidelines [25], complies with the NRC criteria for implementing the PCP, except for oily wastes.

Table 1. Evaluation of Proposed Radiological Effluent Technical Specifications (RETS), North Anna Power Station Units 1 and 2

	Technical Specifications		Replaces or Updates Existing Tech. Specs.	
	NRC Staff Std. RETS NUREG-0472 (Section)*	Licensee Proposal (Section)	(Section)	Evaluation
Effluent Instrumentation	3/4.3.3.3.10 3/4.3.3.3.11	3/4.3.3.3.10 3/4.3.3.3.11	3.3.3.1 Appendix A	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	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	3/4.11.1.2, 3/4.11.2.2, 3/4.11.2.3, 3/4.11.4	To be added to Appendix A	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	To be added to Appendix A	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	To be added to Appendix A	Meets the intent of NRC criteria
Explosive Gas Mixtures	3/4.11.2.5B	3/4.11.2.5	To be added to Appendix A	Meets the intent of NRC criteria on an interim basis
Solid Radioactive Waste	3/4.11.3	3/4.11.3	To be added to Appendix A	Meets the intent of NRC criteria
Environmental Monitoring	3/4.12.1	3/4.12.1	To be added to Appendix A	Meets the intent of NRC criteria
Audits and Reviews	6.5.1, 6.5.2	6.5.1.4, 6.5.3	6.5.1.6, 6.5.2.1, 6.5.2.7	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	6.15, 6.16, 6.17	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. Submittal of North Anna Power Station, Units 1 and 2
"Requirements of Section VB of Appendix I, 10CFR Part 50"
June 4, 1976

14. Amendments to Operating License for North Anna, Units 1 and 2
"Proposed Technical Specifications, Change No. 17"
March 5, 1979

15. C. M. Stallings (VEPCO)
Letter to H. Denton (USNRC) with ODCM attached
July 3, 1979

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

17. "Radiological Effluent Technical Specification Implementation, Comparison of Plant and Model RETS"
Franklin Research Center, Draft dated April 26, 1982

18. "Radiological Effluent Technical Specification Implementation, Technical Review of Plant Offsite Dose Calculation Manual"
Franklin Research Center, Draft dated April 26, 1982

19. "Trip Report of Site Visit to North Anna Units 1 and 2," prepared by A. Cassell/S. Pandey (FRC, sent to C. Willis/F. Congel/W. Meinke (NRC)
July 6, 1982)

20. "VEPCO-North Anna, Units 1 and 2, RETS and ODCM," Final Draft Copy with Attachment 3, "Justification for Deviations," authored by E. R. Smith
September 16, 1982

21. Informal Technical Communication from S. Pandey/A. Cassell (FRC) to F. Congel/C. Willis/W. Meinke (USNRC)
"RETS Review Questions"
October 13, 1982

22. "ODCM Review of North Anna, Units 1 and 2, Final Submittal with Eight Points Requiring Clarification"
Informal Technical Communication from A. Cassell/S. Pandey (FRC) to F. Congel/C. Willis/W. Meinke (USNRC)
October 20, 1982

23. Telephone Conference between J. Liberstein/A. Stafford L./Thomasson/ G. Shukla (VEPCO), and A. Cassell/S. Y. Chen (FRC), to resolve questions on clarification of ODCM, submitted to NRC under Reference No. 23, dated November 9, 1982

24. D. L. Stewart (VEPCO)
Letter of Transmittal to NRC
Subject: Request for Amendment Change, "Amendment to Operating Licensee NPF-7, North Anna Power Station Units 1 and 2, Proposed Technical Specification Changes"
December 17, 1982

25. C. Willis (NRC)
Letter to S. Pandey (FRC)
Subject: Criteria for Process Control Program
January 7, 1983

26. Telephone Conversation between NRC Staff and VEPCO, as summarized by W. Meinke (NRC)
Subject: Resolution of Fifteen Discrepancies in RETS Draft of September 16, 1982, for North Anna Power Station Units 1 and 2
November 1, 1982

27. "Comparison of Specification NUREG-0472, Radiological Effluent Technical Specifications for PWRs, vs. Licensee Final Submittal, dated December 17, 1982, of Radiological Effluent Technical Specifications for North Anna Power Station Units 1 and 2"
Franklin Research Center, January 27, 1983

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

29. C. Willis (NRC)
Letter to S. Pandey (FRC)
Subject: Control of explosive gas mixture in PWRs
December 18, 1981

30. C. Willis and F. Congel (NRC)
"Status of NRC Radiological Effluent Technical Specification Activities"
Presented at the AIF Conference on NEPA and Nuclear Regulations, Washington, D.C.
October 4-7, 1981

31. C. Willis (NRC)
Memo to P. C. Wagner (NRC)
"Plan for Implementation of RETS for Operating Reactors"
November 4, 1981

32. W. P. Gammill (NRC)
Memo to P. C. Wagner (NRC)
"Current Position on Radiological Effluent Technical Specifications (RETS) Including Explosive Gas Controls"
October 7, 1981

33. "An Acceptable Radiological Environmental Monitoring Program"
Radiological Assessment Branch Technical Position, Revision 1
November 1979

34. Methods for Demonstrating LWR Compliance with the EPA Uranium Fuel Cycle Standard (40CFR190)
NRC, February 1980
NUREG-0543

35. 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