UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

AUG 7 1984

Docket No. 50-354

R. L. Mittl, General Manager
Nuclear Assurance and Regulation
Public Service Electric & Gas Company
80 Park Plaza, T22A
Newark, New Jersey 07101

Dear Mr. Mittl:

Pursuant to our letter to you dated March 5, 1984, which transmitted the Hope Creek Draft SER, enclosed are additional Draft SER sections resulting from staff review of the Hope Creek OL application.

The enclosure contains Draft SER Sections 6.5.1, 10.4.2, 10.4.3, 11.1 through 11.5 and 15.7.3. As noted within the text, based on our review of information submitted to date, the following items remain to be addressed:

1. Submit a copy of the "process control program" (PCP) for solid radioactive waste; otherwise a license condition will require NRC approval of the PCP before solid radioactive waste is processed.

2. Regarding ESF filter testing, FSAR Table 6.8-6, page 6, table note b, states charcoal filter leakage testing is acceptable at a penetration of 0.25%. This value is inconsistent with Regulatory Guide 1.52 which requires in-place leakage testing for both HEPA and charcoal filters with an acceptance of less than 0.05% penetration. The licensee should correct this statement or provide justification for departure with Regulatory Guide 1.52.

3. Regarding FSAR Table 6.8-6, page 7, note 3, change to read, "Field leak tests are conducted after each change of HEPA or charcoal filters in a system."

4. Describe the Toxic Chemical detectors and associated instrumentation included in the Control Room Air Supply System.

5. Regarding the ESF and non-ESF air filtration unit drains, what keeps the air traps in the water drains filled with water? Is there an automatic fill system?

By letter dated July 24, 1984, you were requested to respond to items 2 through 5 above. Upon receipt, the staff will review your responses to determine their acceptability. Should additional information be required, a meeting with the staff may be in order.

Please contact us should you have any questions.

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

cc: See next page

AUG 7 1984

Please contact us should you have any questions.

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

cc: See next page

DL:LB#2/PM
DWagner:ldm
8/7/84

DL:LB#2/BC
ASchwencer
8/7/84

Distribution:
Docket File
NRC PDR
Local PDR
PRC System
NSIC
LB#2 Reading
P. Shuttleworth
D. Wagner
L. Dewey
ACRS (16)
E. Jordan
N. Grace

Hope Creek

Mr. R. L. Mittl, General Manager
Nuclear Assurance & Regulation
Public Service Electric & Gas Company
80 Park Plaza T22A
Newark, New Jersey 07101

cc:
Troy B. Conner, Jr. Esquire
Conner & Wetterhahn
1747 Pennsylvania Aveneu N.W.
Washington, D.C. 20006

Richard Fryling, Jr., Esquire
Associate General Solicitor
Public Service Electric & Gas Co.
80 Park Plaza T5E
Newark, New Jersey 07101

Mr. P.R.H. Landrieu
Project Manager - Hope Creek
Public Service Electric & Gas Co.
80 Park Plaza T17A
Newark, New Jersey 07101

Richard F. Engel
Deputy Attorney General
Division of Law
Environmental Protection Section
Richard J. Hughes Justice Complex CN-112
Trenton, New Jersey 08625

Mr. David A. Caccia
Box 70, A.R.D. #2
Sewell, New Jersey 08080

Mr. R. P. Douglas
Manager-Licensing & Analysis
Public Service Electric & Gas Co.
80 Park Plaza T22A
Newark, New Jersey 07101

Mr. B. G. Markowitz, Project Manager
Bechtel Power Corporation
50 Beale Street
P. O. Box 3965
San Francisco, California 94119

Susan C. Remis
Division of Public Interest Advocacy
New Jersey State Department of
the Public Advocate
Richard J. Hughes Justice Complex
CN-850
Trenton, New Jersey 08625

Office of Legal Counsel
Department of Natural Resources
and Environmental Control
89 Kings Highway
P.O. Box 1401
Dover, Delaware 19903

Mr. K. W. Burrowes, Project Engineer
Bechtel Power Corporation
50 Beale Street
P. O. Box 3965
San Francisco, California 94119

Mr. W. H. Bateman
Resident Inspector
U.S.N.R.C.
P. O. Box 241
Hancocks Bridge, New Jersey 08038

Mr. J. M. Ashlev
Senior Licensing Engineer
c/o PSE&G Company
Bethesda Office Center, Suite 550
4520 East-West Highway
Bethesda, Maryland 20814

Office of the Director
DNREC - Division of Environmental Control
89 Kings Highway
P. O. Box 1401
Dover, Delaware 19903

Mr. R. S. Salvesen
General Manager-Hope Creek Operation
Public Service Electric & Gas Co.
P.O. Box A
Hancocks Bridge, New Jersey 08038

Mr. B. A. Preston
Principal Engineer
Public Service Electric & Gas Co.
80 Park Plaza T22A
Newark, New Jersey 07101

Mr. A.E. Giardino
Manager - Quality Assurance E&C
Public Service Electric & Gas Co.
P.O. Box A
Hancocks Bridge, New Jersey 08038

State House Annex
ATTN: Deputy Attorney General
State of New Jersey
36 West State Street
Trenton, New Jersey 08625

Ms. Mary Henderson, Clerk
Lower Alloways Creek Township
Salem County, New Jersey 08079

Commissioner
Department of Public Utilities
State of New Jersey
101 Commerce Street
Newark, New Jersey 07102

U.S. Environmental Protection Agency
ATTN: EIS Coordinator
Region II
26 Federal Place
New York, New York 10007

6.5 Engineered Safety Feature (ESF) Filter Systems

6.5.1 ~~Introduction~~ SYSTEM DESCRIPTION AND EVALUATION

Section 6.5 of the Final Safety Analysis Report (FSAR) contains information pertaining to engineered safety feature (ESF) filter systems, their design bases, and applicable acceptance criteria.

~~6.5.2 Acceptance Criteria~~

The staff has reviewed the applicant's design, design criteria, and design bases for the ESF filter systems for the Hope Creek Generating Station. The acceptance criteria used as the basis for our evaluation are set forth in the Standard Review Plan (SRP) NUREG-0800, in Section II of SRP 6.5.1. These acceptance criteria include the applicable General Design Criteria (Appendix A to 10 CFR Part 50), ANSI Standard N509-1980, "Nuclear Power Plant Air Cleaning Units and Components," and ANSI Standard N510-1980, "Testing of Nuclear Air Cleaning Systems." Guidelines for implementation of the requirements of the acceptance criteria are provided in the ANSI Standards, Regulatory Guides, and other documents identified in Section II of the SRP. Conformance to the acceptance criteria provides the bases for concluding that the ESF filter systems meet the requirements of 10 CFR Part 50.

~~6.5.3 Method of Review~~

The Hope Creek Station has two ESF filter systems, the Control Room Emergency Filter (CREF) System and the Filtration, Recirculation and

Ventilation System (FRVS). Each of these systems was reviewed in accordance with the SRP. The results of these reviews are discussed below.

~~6.5.4 Review Discussion~~

~~6.5.4.1~~ Control Room Emergency Air Filter System (CREFS)

The function of the control room emergency filtration system is to supply non-radioactive air to the control room after a DBA and to pressurize the control room. This system will permit operating personnel to remain in the control room following a DBA. The CREFS is a redundant system; each train processes air at a flow rate of 4000 cfm (3000 cfm recirculation and 1000 cfm outside air). Each train contains the following components: fan, prefilter, electric heater, HEPA filter, carbon adsorber, and HEPA filter. The heating units are provided for relative humidity controls and a water spray system is provided in the event of high temperature or fire in the carbon beds. The equipment and components are designed to seismic Category I, powered by Class 1E buses and are located in a seismic Category I structure. The system will be automatically activated by an emergency signal and can also be activated manually from the control room.

From the system description in the FSAR, we determined that the air cleanup system of the CREFS is designed consistent with GDC's 19, 61, and 64, as referenced in the SRP. In our evaluation of the system design efficiencies for removal of elemental iodine and organic iodine, we assigned the system decontamination efficiencies of 90% for normal and 99% for accident elemental and organic iodines for the CREFS charcoal adsorbers (one 4 inch deep bed) and 99% for particulates for the CREFS HEPA filters, in accordance with Regulatory Guides 1.140 and 1.52. Provisions for instrumentation, readout, and alarm were determined to be consistent with Table 6.5.1-1 of the SRP. Adequate indication and alarms are provided in the control room to assure proper monitoring of systems performance, as suggested in Regulatory Guide 1.52.

Based on the above determinations, we find that the CREFS is adequately designed to control the pressure and the concentration of radioactive materials in control room air in accordance with applicable regulations following a postulated DBA.

~~6.5.4.2~~ <u>Filtration Recirculation and Ventilation System (FRVS)</u>

The function of the Filtration Recirculation and Ventilation System (FRVS) is to process the leakage of radioactive materials from the drywell into the Reactor Building following a design basis accident (DBA). The

FRVS is a seismic Category I design. The FRVS consists of a recirculation system and an exhaust system. The recirculation system removes particulate and radioactive iodines from the reactor building air. It consists of six redundant 30,000 cfm filter units. Each unit is made up of the following components: a fan, moisture separator, electric heater, HEPA filter, 2-inch charcoal adsorber, HEPA filter, cooling coil and associated air flow, and temperature pressure and humidity instrumentation.

During a DBA, four of the six recirculation units are automatically started filtering and mixing at 120,000 cfm to the reactor building air. Part of this filtration, 9000 cfm, is further processed by the FRVS ventilation exhaust system. This exhaust system consists of two 100% redundant filtration units made up of a fan, electric heater, 2-inch deep charcoal adsorber, HEPA filter and associated flow, and temperature pressure and relative humidity instrumentation. This ventilation exhaust system also is automatically started on a DBA signal to maintain the reactor building at a negative differential pressure from the outside at greater than 0.25 inches of water. This negative differential pressure prevents air from being released to the environment without processing through the filter units.

All the charcoal adsorbers in the FRVS systems are protected by a water deluge spray system in case of overheating or fire.

The allowed iodine removal credit for staff accident evaluations pertaining to reactor building releases is 99% removal for both elemental and organic iodine.

From the system description in the FSAR, we determined that the SGTS is designed consistent with GDC's 41, 42, 43, 61, and 64, as referenced in the SRP. In our evaluation of the system design efficiencies for removal of elemental iodine and organic iodines, we assigned the system decontamination efficiencies of 99% for accident and organic iodines for the FRVS carbon adsorbers (two 2-inch deep bed), in accordance with Regulatory Guides 1.52, and 99% for particulates for the FRVS HEPA filters. Provisions for instrumentation, readout, and alarm were determined to be consistent with Table 6.5.1-1 of the SRP. Adequate indication and alarms are provided in the control room to assure proper monitoring of system performance, as suggested by Regulatory Guide 1.52.

~~6.5.6~~ Evaluation Findings

The staff concludes that the design of the ESF atmosphere cleanup systems, including the equipment and instrumentation to control the release of radioactive materials in gaseous effluents following a postulated DBA, are acceptable. This conclusion is based on the applicant having met the requirements of GDC's 19, 41 and 61 by providing ESF atmosphere cleanup systems on the control room habitability, containment and associated systems. The applicant has met the requirements of GDC's 42, 43 and 64 by providing for inspecting and testing the ESF atmosphere cleanup systems and monitoring for radioactive materials in effluents from these systems. In meeting these regulations, the applicant has demonstrated that the design of the ESF atmosphere cleanup systems meet the guidelines of Regulatory Guide 1.52 and the ANSI N509 and N510 industry standards, as referenced in the SRP. We have reviewed the applicant's system descriptions and design criteria for the ESF atmosphere cleanup systems. Based on our evaluation, with respect to the SRP criteria, we find the proposed ESF atmosphere cleanup systems acceptable. The filter efficiencies given in Table 2 of Regulatory Guide 1.52 are appropriate for use in accident analyses.

10.4.2 Main Condenser Evacuation System

10.4.2.1 Introduction

Section 10.4.2 of the Final Safety Analysis Report (FSAR) contains information pertaining to the main condenser evacuation (air removal) system, the system design bases, and the applicable acceptance criteria.

10.4.2.2 Acceptance Criteria

The staff has reviewed the applicant's design, design criteria, and design bases for the main condenser evacuation system (MCES) for Hope Creek. ~~Unit No. 1.~~ The acceptance criteria used in our evaluation are those in the Standard Review Plan (SRP), NUREG-0800, in Section II of SRP 10.4.2. The SRP acceptance criteria include the applicable GDC (Appendix A to 10 CFR Part 50) and Heat Exchanger Institute Standard "Standards for Steam Surface Condensers." Guidelines for implementation of the requirements of the acceptance criteria are provided in the Regulatory Guides referenced in Section II of the SRP. Conformance to the acceptance criteria of the SRP provides the bases for concluding that the MCES meets the requirements of 10 CFR Part 50.

10.4.2.3 Method of Review

The MCES was reviewed in accordance with the SRP. The results of the review are discussed below.

10.4.2.4 Review Discussion

The main condenser evacuation system is designed to (1) establish a vacuum on the condenser, and (2) remove noncondensible gases from the main condenser and discharge them to the gaseous radwaste system.

The major components are two 50% capacity mechanical vacuum pumps and redundant 100% capacity steam jet air ejector trains. The main condenser evacuation system is designed to minimize the potential for explosion in the piping upstream of the catalytic recombiners in the offgas system. This is achieved by mixing sufficient dilution steam via the steam jet air ejector discharge with the noncondensible gases to limit the hydrogen concentration to less than four percent by volume. The steam jet air ejectors, intercondenser, after condenser, and the offgas system (Section 11 of this report) are designed to withstand a detonation in the offgas system. The hydrogen concentration at the outlet of the third stage air ejector will be maintained below four volume percent hydrogen by virtue of the dilution steam. On indication of low steam pressure or low steam flow, the operating steam jet air ejector will be removed from service and the standby air ejector train activated. A hydrogen analyzer will be provided on the outlet of each recombiner so that action may be taken to preclude the buildup of explosive mixtures.

Prior to startup, the mechanical vacuum pump is used to initially evacuate the main condenser to a vacuum level sufficient for the steam driven air ejectors to take over. Because the mechanical vacuum pumps are employed during startup operations, generally enough time has elapsed for radioactive decay to have significantly reduced the level of radioactive gases trapped within the main condenser. The main vacuum pump discharges the air to the environment out through the turbine building vent. The exhaust is continuously sampled for acceptable low concentration of activity by isokinetic radiation monitors located in the turbine building ventilation exhaust duct.

10.4.2.5 Evaluation Findings

The main condenser evacuation system includes equipment and instruments to establish and maintain condenser vacuum and to prevent an uncontrolled release of gaseous radioactive material to the environment. The scope of our review included the system capability to transfer radioactive gases to the gaseous waste processing system or ventilation exhaust systems, and the design provisions incorporated to monitor and control releases of radioactive materials in effluents. The staff has reviewed the applicant's system descriptions, piping and instrumentation diagrams, and design criteria for the components of the main condenser evacuation system in accordance with the SRP.

The staff concludes that the MCES design is acceptable in that the applicant has met the requirements of GDC's 60 and 64 with respect to the control and monitoring of releases of radioactive materials to the environment. The applicant has met the criteria for applying appropriate industrial standards on the design of heat exchangers and air ejectors.

10.4.3 Turbine Gland Sealing System

10.4.3.1 Introduction

Section 10.4.3 of the FSAR contains information pertaining to the turbine gland sealing system, the design bases, and applicable acceptance criteria.

10.4.3.2 Acceptance Criteria

The staff has reviewed the applicant's design, design criteria, and design bases for the turbine gland sealing system for Hope Creek. ~~Unit No. 1.~~ The acceptance criteria used as the basis for our evaluation are set forth in Section 10.4.3 of the Standard Review Plan (SRP) NUREG-0800. The acceptance criteria are the applicable GDC (Appendix A to 10 CFR Part 50) as referenced in the SRP. Guidelines for implementation of the requirements of the acceptance criteria are provided in the Regulatory

Guides identified in Section II of the SRP. Conformance to the acceptance criteria provides the bases for concluding that the turbine gland sealing system meets the requirements of 10 CFR Part 50.

10.4.3.3 Method of Review

The turbine gland sealing system for Hope Creek, ~~Unit 1,~~ was reviewed in accordance with SRP 10.4.3. The results of the review are dicussed below.

10.4.3.4 Review of Turbine Gland Sealing System

The turbine gland sealing system (TGSS) is designed to provide a continuous supply of slightly radioactive steam to the main turbine shaft seals, reactor feed pump turbine shaft seals, the stem packings of stop valves, control valves, and combined intermediate valves and bypass valves. This sealing steam is used to prevent air leaking out of the steam cycle into the Turbine Building.

The TGSS includes a steam seal evaporator whereby sealing steam is generated utilizing heat transferred by passing nuclear steam through an immersed tube bundle; instruments and controls to provide a source of sealing steam to the annulus space where the turbine and large steam valve shafts penetrate their casings; and a seal packing exhaust condenser and vacuum exhausters where the seal steam condenses. Any air admitted is exhausted through the turbine building vent. The scope of our review included the source of sealing steam and the provisions incorporated to monitor and control releases of radioactive material in gaseous effluents in accordance with GDC 60 and 64. We have reviewed the applicant's system descriptions and design criteria for the components of the TGSS and found them consistent with Regulatory Guide 1.26.

10.4.3.5 Evaluation Findings

The staff concludes that the turbine gland sealing system design is acceptable in that the applicant has met the requirements of GDC 60 and 64 with respect to the control and monitoring of releases of radioactive materials to the environment.

11.0 RADIOACTIVE WASTE MANAGEMENT

11.1 Introduction

The radioactive waste management systems for Hope Creek[redacted] is designed to provide for the controlled handling and treatment of liquid, gaseous and solid wastes. The liquid waste system processes wastes from equipment and floor drains, sample wastes, decontamination and laboratory wastes, and chemical wastes. The gaseous radioactive waste system provides holdup capacity to allow decay of short-lived noble gases from the main condenser air ejector and treatment of ventilation exhausts through HEPA filters and carbon adsorbers as necessary to reduce releases of radioactive materials to "as low as is reasonably achievable" levels in accordance with 10 CFR Part 20 and 10 CFR Part 50.34a. The solid waste management system collects and processes wet and dry waste generated by the plant and packages the material into a solid product for shipment to a permanent disposal site. The radioactive waste management review includes process and effluent radiological monitoring and sampling systems.

11.1.1 Acceptance Criteria

The staff has reviewed the applicant's design, design criteria and design bases for the radioactive waste management systems for the Hope Creek Station. The acceptance criteria used as the basis for our evaluation are set forth in the SRP, NUREG-0800, in Section II of SRPs 11.1, 11.2, 11.3, 11.4, and 11.5. These acceptance criteria include the applicable GDC (Appendix A to 10 CFR Part 50), Section 20.106 of 10 CFR Part 20, Appendix I to 10 CFR Part 50, and ANSI Standard N13.1, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities." Guidelines for implementation of the requirements of the acceptance criteria are provided in the ANSI Standards, Regulatory Guides, and other documents identified in Section II of the SRP. Conformance to the acceptance criteria provides the bases for concluding that the radioactive waste management systems meet the requirements of 10 CFR Parts 20 and 50.

11.1.2 Liquid and Gaseous Effluent Source Terms

The estimated releases of radioactive materials in liquid and gaseous effluents were calculated by the applicant using the BWR GALE Code described in NUREG-0016. The staff has reviewed these source terms and found them consistent with the guidelines of SRP 11.1. The applicant's source terms were used in our evaluation. These source terms are given in Table 11.1-1 of the FSAR. The principal parameters used in our calculations are given in Table 11.1 of this SER.

11.2 Liquid Waste Management System

11.2.1 System Description and Review

The liquid radioactive waste management system consists of process equipment and instrumentation necessary to collect, process and monitor and recycle or dispose of radioactive liquid wastes. The liquid wastes from operation of Hope Creek~~, Unit No. 1,~~ will be collected and processed in five subsystems. The high purity liquid radwaste system is designed to collect and process wastes from equipment drains and other non-contaminated sources of reactor coolant. The low purity liquid radwaste system is designed to collect and process floor drain waste and other potentially contaminated waste. The regenerant chemical radwaste subsystem receives high conductivity waste from the condensate and radwaste demineralizer regeneration subsystem. It processes the residue from spent resin regeneration, concentrates the radioactive materials and delivers them for solid radwaste disposal. The Chemical Waste subsystem processes chemical lab drains and decontamination solutions and the fifth is the detergent drain waste subsystem that processes laundry and decontamination drains.

The liquid radwaste processing systems are designed to store processed water for eventual reuse in the plant. On occasion, for water inventory management, processed water will be released under controlled conditions to the environment. A radiation monitor in the plant discharge line will automatically terminate liquid waste discharges if radiation measurements exceed a predetermined level.

The equipment drain subsystem processes the low conductivity, high purity wastes. Wastes will be processed through a precoated backwash filter and a mixed bed demineralizer before being stored in two waste sample tanks. From these tanks, the processed water is stored in the condensate storage tanks or a portion can be discharged to the environment. The licensee estimates the equipment drain subsystem will receive waste input flow at approximately 30,500 gallons per day. These inputs are consistent with SRP guidelines. Adequate initial tank storage (two 29,000 gallons) is provided to accommodate flexible operation and the process flow rate (180 gpm) is sufficient to treat the daily inputs within an adequate time frame (3 hours).

The floor drain subsystem processes higher conductivity, low purity wastes. Waste is initially collected in tanks (two 15,000 gal tanks) which later will be processed through a precoat backwash filter and a mixed bed demineralizer, in series, prior to being collected in the floor drain sample tanks. The applicant estimates the floor drain subsystem waste input to be approximately 4,700 gallons per day. The design process capacity of the floor drain subsystem is approximately 170 gallons per minute. This flow rate is sufficient to process the daily inputs within an acceptable time duration (1 hour).

The regenerant waste subsystem will process resin regenerant from the condensate and radwaste demineralizers and also high conductivity waste from radwaste area drains. Wastes are first collected in waste neutralizer tanks where the material can be chemically neutralized. Then it is processed through an evaporator package where water is separated out and sent to the high purity waste system leaving a high concentrated mixture of resin regenerant and solids on the evaporator bottoms for processing to the concentrated waste tanks for interim storage. The concentrated waste is later sent to the solid waste processing system for solidification and disposal.

The chemical waste processing system collects laboratory wastes, decontamination solutions, sample rack drains, and filter drains in a 4,500 gal chemical waste tank. In this tank the solution can be chemically neutralized. These chemical wastes are normally evaporated to reduce volume. The concentrate is discharged to concentrated waste tanks for interim holdup prior to being sent to the solid waste system for solidification.

The detergent waste processing system collects laundry waste and personnel decontamination drain. The detergent waste are processed by filtration, monitored for radioactivity, and then discharged to the cooling tower blowdown.

In our evaluation of the liquid radioactive waste management system, we considered: (1) the capability of the system for keeping the levels of radioactivity in effluents "as low as is reasonably achievable" based on expected radwaste inputs over the life of the plant, (2) the capability of the system to maintain releases below the limits in 10 CFR Part 20 and also to limit radiological doses to less than allowed by Appendix I to 10 CFR Part 50, during periods of fission product leakage at expected levels from the fuel, (3) the capability of the system to meet the processing demands of the station during anticipated operational occurrences, (4) the quality group and seismic design classification applied to the equipment and components and structures housing the system, and (5) the design features that are incorporated to control the releases of radioactive materials in accordance with GDC 60.

The estimated releases of radioactive materials in liquid effluents were calculated using the BWR GALE Code described in NUREG-0016 (Rev. 1). The principal parameters used in the staff calculations are given in Table 11.1 of this SER.

11.2.2 Evaluation Findings

The liquid radwaste systems include the equipment necessary to control the releases of radioactive materials in liquid effluents in accordance with GDC 60 and 61 of Appendix A of 10 CFR Parts 50 and 50.34a. Capacities of principal components considered in the liquid waste processing system evaluation are listed in Table 11.2-14 of the FSAR. The staff concludes that the design of the liquid waste management system is acceptable and meets the requirements of 10 CFR Part 20, Section 20.106; 10 CFR Part 50, Section 50.34a; GDC 60 and 61; and 10 CFR Part 50, Appendix I, as referenced in the SRP. This conclusion is based on the following:

1. The applicant has met the requirements of Section II.A of Appendix I of 10 CFR Part 50 with respect to dose limiting objectives by proposing a liquid radwaste treatment system that is capable of maintaining releases of radioactive materials in liquid effluents such that the calculated individual doses to an unrestricted area from all liquid pathways of exposure are less than 5 millirems/yr to the total body and less than 15 millirems/yr to any organ.
2. The staff has concluded that the applicant has met the requirements of the Commission's September 4, 1975 Annex to Appendix I of 10 CFR Part 50 with respect to meeting the site activity

release limitations and "as low as reasonably achievable" criterion, and is, therefore, exempt from the cost-benefit analysis required by Section II.D of Appendix I to 10 CFR Part 50.

3. The applicant has met the requirements of 10 CFR Part 20, Section 20.106, since we have considered the potential consequences resulting from reactor operation and have determined that the concentrations of radioactive materials in liquid effluents in unrestricted areas will be a small fraction of the limits in 10 CFR Part 20, Appendix B, Table II, Column 2.

4. The applicant has met the requirements of GDC 60 and 61 with respect to controlling releases of radioactive material to the environment, since we have considered the capabilities of the proposed liquid radwaste treatment system to meet the demands of the plant due to anticipated operational occurrences and have concluded that the system capacity and design flexibility are adequate to meet the anticipated needs of the plant. We have reviewed the applicant's quality assurance provisions for the liquid radwaste systems, the quality group classifications used for system components, and the seismic design applied to structures housing these systems. The design of the systems and structures housing these systems meet the criteria as set forth in Regulatory Guide 1.143 (Rev. 1). We have

reviewed the provisions incorporated in the applicant's design to control the release of radioactive materials in liquids due to inadvertent tank overflows and conclude that the measures proposed by the applicant are consistent with the criteria, as set forth in Regulatory Guide 1.143 (Rev. 1).

11.3 Gaseous Waste Processing System

11.3.1 System Description and Review Dicussion

The gaseous radioactive waste processing and plant ventilation systems are designed to collect, store, process, monitor, and discharge potentially radioactive gaseous wastes which are generated during normal operation of the plant. The systems consist of equipment and instrumentation necessary to reduce releases of radioactive gases and particulates to the environment. The principal sources of gaseous waste are the effluents from the gaseous waste processing system, condenser mechanical vacuum pumps, and ventilation exhausts from the reactor building, auxiliary building, drywell, and turbine building.

The gaseous waste processing system (GWPS) for Hope Creek is a main condenser air ejector charcoal system. This system collects, processes and stores fission product gases removed from the main condenser via air ejectors and then processes these gases through a recombiner, cooler/condenser, 10 minute delay pipe, followed by relative humidity reduction and then noble gas adsorption and decay through a series of ten cooled charcoal delay tanks. The gas discharge from the delay tanks passes through a HEPA filter and is discharged to the environment through the offgas building vent.

The reactor building ventilation exhaust system discharges air (98,000 cfm) from the reactor building and drywell purge to the atmosphere through HEPA filters only. After shutdown, prior to refueling, the drywell and torus atmosphere is recirculated for 30 hours for radioactivity removal by the containment prepurge cleanup system. This system consists of a roughing filter, electric heaters for humidity control, HEPA/charcoal/HEPA filters cascade, and a 3,000 cfm circulation fan. Gases released from radwaste system equipment vents (such as tanks, evaporator reliefs, phase separators, and solid waste fill casks) are passed through redundant HEPA/charcoal filtration units. The filtration unit consists of particulate removal, a heater element for humidity control, and a HEPA/charcoal/HEPA filter cascade. Exhaust flow from general spaces of the auxiliary building is filtered by HEPA filters only.

Exhaust flow from the refueling floor of the reactor building is normally unfiltered unless activity is detected in the refueling flow exhaust duct. If the latter is the case, then the refueling floor exhaust flow is diverted through redundant HEPA/charcoal filtration units prior to release to the atmosphere. These filtration units are part of the Filtration Recirculation and Ventilation systems discussed in Section 6.5.4.2 of this SER.

The turbine building ventilation exhaust is unfiltered. However, the main condenser mechanical vacuum pump discharge is filtered by the HEPA filters of the Reactor Building Ventilation Exhaust system.

The major source of gaseous radwaste during normal plant operation will be offgas from the main condenser. Hope Creek has an offgas system consisting of catalytic hydrogen-oxygen recombiners, a ten-minute holdup pipe to permit decay of short-lived radioisotopes, relative humidity reduction, a 65°F charcoal (RECHAR) delay train, and a HEPA filter. All active components are redundant. The recombiners are sized to maintain hydrogen concentration below four percent; dual hydrogen analyzers are provided to monitor hydrogen concentration and, additionally, the offgas system is designed to withstand the effects of a hydrogen detonation. The nine charcoal beds and one charcoal guard bed are maintained at approximately 65°F by redundant heating and air conditioning systems. The gaseous waste processing system and the plant ventilation systems are described in Sections 11.3 and 9.4 of the FSAR, respectively, with design details provided separately in proprietary documents.

In our evaluation of the gaseous radwaste management system, we considered the following SRP criteria: (1) the capability of the system for keeping the levels of radioactivity in effluents "as low as is reasonably achievable" based on expected radwaste inputs over the life of the plant, (2) the capability of the system to maintain releases below the limits in 10 CFR Part 20 during periods of fission product leakage at expected levels from the fuel, (3) the capability of the system to meet the processing demands of the station during anticipated operational occurrences, (4) the seismic design classification applied to the equipment and components and structures housing the system, (5) the design features that are incorporated to control the releases of radioactive materials in accordance with GDC 60, and (6) the potential for gaseous releases due to hydrogen explosion in the gaseous radwaste system.

The estimated releases of radioactive materials in gaseous effluents were calculated by the staff using the BWR GALE Code described in NUREG-0016

(Rev. 1), "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWRs)." The principal parameters used in these calculations are given in Table 11.1 of this SER. The gaseous source term is provided in Table 11.1-1 of the applicant's FSAR.

We have reviewed the applicant's quality assurance provisions for the gaseous radwaste systems, the quality group classifications used for system components, the seismic design criteria applied to the design of the system, and of structures housing the radwaste systems. The design of the system and structures housing these systems meet the criteria as set forth in Regulatory Guide 1.143 (Rev. 1) and referenced in the SRP.

We have reviewed the provisions incorporated in the applicant's design to control releases due to hydrogen explosions in the gaseous radwaste system and conclude that the measures proposed by the applicant are adequate to prevent the occurrences of an explosion or to withstand the effects of a hydrogen detonation.

We have reviewed the provisions incorporated in the applicant's design to collect airborne radioactivity materials in the normal ventilation exhaust systems during normal plant operation, including anticipated operational occurrences. We find the design of air filtration and adsorption units consistent with Regulatory Guide 1.140 (Rev. 1), as referenced in the SRP.

11.3.2 Evaluation Findings

The staff concludes that the design of the gaseous waste management system is acceptable and meets the requirements of 10 CFR Part 20, Section 20.106; 10 CFR Part 50, Section 50.34a; GDC 3, 60 and 61; and 10 CFR Part 50, Appendix I, as referenced in the SRP. This conclusion is based on the following findings:

1. The applicant has met the requirements of GDC 60 and 64 with respect to controlling releases of radioactive material to the environment by assuring that the design of the gaseous waste management system includes the equipment and instruments necessary to detect and to control the release of radioactive materials in gaseous effluents. Capacities of principal components considered in the gaseous waste processing system evaluation are listed in Table 11.2.
2. The applicant has met the requirements of Appendix I of 10 CFR Part 50 by meeting the "as low as is reasonably achievable"

criterion as follows:

a. Regarding Section II.B and II.C of Appendix I, we have considered releases of radioactive material (noble gases, radioiodine and particulates) in gaseous effluents for normal operation including anticipated operational occurrences based on expected radwaste inputs over the life of the plant. We have determined that the proposed gaseous waste management system is capable of limiting releases of radioactive materials in gaseous effluents such that the calculated individual doses in an unrestricted area from all pathways of exposure are less than 5 mrems to the total body or 15 mrems to the skin and less than 15 mrems to any organ from releases of radioiodine and radioactive material in particulate form.

b. The applicant has met the requirements of the Commission's September 4, 1975 Annex to Appendix I to 10 CFR Part 50 with respect to meeting the siting limits and "as low as reasonably achievable" criterion, and is, therefore, exempt from the cost-benefit analysis required by Section II.D of Appendix I to 10 CFR Part 50.

3. The applicant has met the requirements of 10 CFR Part 20 since we have considered the potential consequences resulting from reactor operation with "a fission product release rate consistent with a

noble gas release rate to the reactor coolant of 100 uCi/MWt-sec at 30 minutes decay" for a BWR and determined that under these conditions, the concentrations of radioactive materials in gaseous effluents in unrestricted areas will be a small fraction of the limits specified in 10 CFR Part 20, Appendix B, Table II, Column 1.

4. We have considered the capabilities of the proposed gaseous waste management system to meet the demands of the plant due to anticipated operational occurrences and have concluded that the system capacity and design flexibility are adequate to meet these demands.
5. We have reviewed the applicant's quality assurance provisions for the gaseous waste management system, the quality group classifications used for system components, the seismic design applied to the design of the system, and of structures housing the radwaste system. The design of the system and of structures housing the system meet the criteria as set forth in Regulatory Guide 1.143 (Rev. 1).
6. We have reviewed the provisions incorporated in the applicant's design to control releases due to hydrogen explosions in the gaseous waste management system and concluded that the measures proposed by the applicant are adequate to prevent the occurrence of an explosion and to withstand the effects of a hydrogen detonation in accordance with GDC 3 of Appendix A to 10 CFR Part 50.

11.4 Solid Waste Management System

11.4.1 Solid Waste Management System

The Hope Creek solid waste management system accepts dry solid waste, evaporator bottoms concentrate, spent powdered and bead resin, filter media slurries, and sludges from phase separators. In summary, the solid waste processing system achieves a volume reduction by mechanically removing free-standing water and by water evaporation. These low water content waste products are then mixed with asphalt at high temperatures and then extruded into 55 gallon drums where the product cools and solidifies. The drums are then capped, checked for surface contamination and stored for shipment offsite.

This volume reduction and solidification process is offered by Werner and Pfleiderer and is described in Topical Report "Radwaste Volume Reduction and Solidification System," WPC-VRS-1 (WPC-VRS-1P, Proprietary). This system design was approved by NRC in the Topical SER dated April 12, 1978 (NRC letter from Karl Kniel, Program Manager, Light Water Reactors Branch No. 2, Division of Project Management to Richard Doyle, Werner and Pfleiderer). Adequate fire protection features must be provided by the licensee to prevent radioactivity releases from a fire related accident.

11.4.2 Evaluation Findings

Based on the information submitted by the applicant, the staff has made the following conclusion:

a. The design of the solid waste management system meets the requirements of 10 CFR Parts 20 and 20.106; 10 CFR Parts 50 and 50.34a; GDC 60, 63 and 64; and 10 CFR Part 71.

b. Sufficient solid waste storage capacity (30 days at normal processing rates) meet the requirement of Branch Technical Position ETSB 11-3.

c. The system proposed design meets the quality assurance group classification and seismic requirement as recommended in Regulatory Guide 1.143 (Rev. 1) for solid radwaste systems.

d. Insufficient information has been provided regarding the details of a solid waste process control program and solid waste requirements of 10 CFR Part 61. Therefore, prior to solid waste processing, the applicant must obtain NRC approval of the solid waste process control program addressing the requirements of 10 CFR Part 61 and Branch Technical Position ETSB 11-3.

e. A fire protection water spray system is provided to protect the process equipment and solid waste product.

11.5 Process and Effluent Radiological Monitoring and Sampling Systems

11.5.1 System Description and Review Discussion

The process and effluent radiological monitoring systems are designed to provide information concerning radioactivity levels in systems throughout the plant, indicate radioactive leakage between systems, monitor equipment performance, and monitor and control radioactivity levels in plant discharges to the environs.

Table 11.3 provides the proposed locations of continuous monitors. Monitors on certain effluent release lines will automatically terminate discharges in the event that radiation levels exceed a predetermined value. Systems which are not amenable to continuous monitoring, or for which detailed isotopic analyses are required, will be periodically sampled and the samples will be analyzed in the plant laboratory.

All normal airborne radioactive releases to the environs from Hope Creek are from two principal points: (1) the south plant vent (which releases at 115 ft above grade the reactor building exhaust, drywell purges, turbine building exhaust, radwaste area exhaust, mechanical vacuum pump exhaust, and auxiliary building exhaust), and (2) the north plant vent at

115 ft above grade (which discharges the condenser offgas processed by the offgas system, the solid radwaste building ventilation exhaust and chemistry lab exhaust system).

During an accident, reactor building air processed by the filtration recirculation ventilation system is discharged at the top of the reactor building.

Redundant radiation monitors are installed in these vents. They sample effluent air downstream of the last point of mixing and provide continuous readout of noble gas and particulate activity. In addition, charcoal adsorbers are provided to sample the air stream for radioiodine. Sampling flow is through a regulated isokinetic probe.

In addition to the two principal plant vent discharge point monitors, ventilation radiation monitors are also provided in the exhaust streams of the reactor building, auxiliary building, drywell purge, turbine building, radwaste areas, offgas building, and technical support center. These monitors are used to identify sources of airborne activity prior to mixing and dilution in the plant exhaust vents.

The principal radioactive liquid effluent release point at Hope Creek is the cooling tower water blowdown. Potentially radioactive inputs to the cooling tower blowdown from liquid radwaste discharges will be continuously monitored for radioactivity prior to and during discharge. Since the cooling tower blowdown is a high flow rate system, the radioactive inputs to the system will be highly diluted. These principal radioactive input streams to the blowdown leg of the circulating water system are continuously monitored (process monitors) and periodically sampled and analyzed. These input streams are the liquid radwaste effluent discharge and the turbine building circulating water sump discharge. The liquid radwaste discharge process monitors provide alarm signals for termination of discharge of the liquid radwaste system in the event a predetermined Technical Specification limit is exceeded.

Also, process liquid radiation monitors are used in the closed cooling water system of the reactor auxiliaries cooling system and the safety auxiliaries cooling system to detect any heat exchanger leakage.

11.5.2 Evaluation Findings

Our review included the locations and types of effluent and process monitoring provided for Hope Creek. ~~Unit No. 1.~~ Based on the plant design and on continuous monitoring locations and intermittent sampling locations, we concluded that all normal and potential release pathways will be monitored. The applicant's description indicates that the process and effluent monitoring system design meets the guidelines in Regulatory Guide 4.15 for quality assurance. We also determined that the sampling and monitoring provisions are adequate for detecting radioactive material leakage to normally uncontaminated systems and for monitoring plant processes which could affect radioactivity releases. On these bases, we consider that the monitoring and sampling provisions meet the requirements of GDC 60, 63 and 64 and the guidelines of Regulatory Guide 1.21 (Rev. 1), and, therefore, meet the acceptance criteria of the SRP. In addition, the applicant has provided appropriate effluent monitors for post accident conditions in accordance with the guidelines of NUREG-0737.

Table 11.1
PRINCIPAL PARAMETERS FOR
THE CALCULATION OF RADIOACTIVE EFFLUENTS
FROM HOPE CREEK, UNIT NO. 1

Thermal power	3430 MWt
Capacity factor	0.8
Total steam flow (10 lb/hr)	14.0
Mass water, reactor vessel (10 lb)	0.38
Cleanup demineralizer flow (10 lb/hr)	0.13
Fraction of feedwater through condenser demineralizer	1.0
Condensate demineralizer regeneration time (days)	30.0
Air ejector offgas holdup (hours)	0.17
Reactor building iodine release fraction	1.0
Reactor building particulate release fraction	0.01
Auxiliary building iodine release r=fraction	1.0
Auxiliary building particulate release fraction	1.0
Radwaste building iodine release fraction	1.0
Radwsate building particulate release fraction	0.01
Charcoal delay system	
Krypton adsorption coefficient (cm /g)	18.5
Xenon adsorption coefficient (cm /g)	330.0
Krypton holdup time, days	3.12
Xenon holdup time, days	55.8
Mass of charcoal (tons)	161

Liquid waste inputs
High purity system
37,100 gallons per day
0.130 Primary coolant activity (PCA)
0.01 Discharge fraction
0.53 Days, collection
0.90 Days, decay
10 Decontamination factor (DF) Iodine
10 Decontamination factor (DF) Cesium
10 Decontamination factor (DF) Other Nuclides

Low purity system
5,700 gallons per day
0.001 Primary coolant activity (PCA)
0.5 Discharge fraction
2.1 Days, collection
0.07 Days, decay
10 Decontamination factor (DF) Iodine
2 Decontamination factor (DF) Cesium
10 Decontamination factor (DF) Other Nuclides

Table 11.1
(Continued)

Chemical waste system
- 600 gallons per day (include radwaste demineralizer regenerant)
- 0.02 Primary coolant activity (PCA)
- 0.0 Discharge fraction
- 2.7 Days, collection
- 0.22 Days, decay
- 10 Decontamination factor (DF) Iodine
- 10 Decontamination factor (DF) Cesium
- 10 Decontamination factor (DF) Other Nuclides

Regenerant Solutions
- 6,290 gallons per day
- 0.10 Discharge fraction
- 0.0 Days, collection
- 0.35 Days, decay
- 10 Decontamination factor (DF) Iodine
- 10 Decontamination factor (DF) Cesium
- 10 Decontamination factor (DF) Other nuclides

Table 11.2

DESIGN PARAMETERS OF PRINCIPAL COMPONENTS
CONSIDERED IN THE EVALUATION OF
LIQUID AND GASEOUS RADIOACTIVE WASTE TREATMENT SYSTEMS

Component	Number	Capacity, Each
Equipment (High Purity) Drain Processing		
Waste collector tanks	2	29,000 gallons
Surge tank	1	61,500 gallons
Pre-Coat equipment drain filter	1	180 gpm
Mixed bed demineralizer	1	180 gpm
Equipment drain sample tank	2	15,550 gallons
Floor Drain Processing System		
Floor drain collector tank	2	15,000 gallons
Pre-Coat filter	1	180 gpm
Mixed bed demineralizer	1	180 gpm
Floor drain sample tanks	2	15,550 gallons
Regenerant Waste Processing System		
Waste neutralizing tanks	2	25,000 gallons
Waste evaporator	2	40 gpm
Concentrated waste storage tanks	2	10,550 gallons
Chemical Waste Processing System		
Chemical waste tank	1	4,000 gallons
Chemical waste evaporator	1	5 gpm
Chemical waste concentrated solution storage tank	1	600 gallons
Gaseous Waste Processing System		
Mass of charcoal		161 tons
Noble gas delay at 77°F		
Krypton		3.1 days
Xenon		55.8 days

TABLE 11.3 (Page 1 of 5)

HOPE CREEK RADIATION MONITORING SYSTEMS

RMS Identification Description and Ref.	Number of Channels	Detector Type(15)(16)	Detector Location(17)	Range	Minimum Detectable Concentration(1)
Main steam line 11.5.2.1.1	4	Gamma ion chamber	Downstream outboard of MSIVs El. 137, Area 26	$1-10^{6}$ mR/h	1 mR/h(13)
Refueling floor exhaust 11.5.2.1.2	3	Beta-scint	Upstream of damper El. 205, Area 15	$10^{-3}-10^{2}$ μC/cc Kr-85	10^{-3} μC/cc at 2.5 mR/hr MFP(7)
Reactor building exhaust 11.5.2.1.3	3	Beta-scint	Upstream of damper El. 189, Area 15	$10^{-3}-10^{-2}$ μC/cc Kr-85	10^{-3} μC/cc
Control room ventilation 11.5.2.1.4	2	Beta-scint	Air inlet plena El. 162, Area 26	$10^{-7}-10^{-4}$ μC/cc Kr-85	10^{-7} μC/cc
Drywell atmosphere post-accident 11.5.2.1.5	2	Gamma ion chamber	Inside containment El. 145, Area 17	$1-10^{7}$ R/h	1 R/h(14) MFP(7)(10)
North plant vent(11) 11.5.2.2.1			Sample panel El. 153, Area 32		
Particulates	1	Beta scint		$5x10^{-12}-1x10^{-6}$ μC/cc Sr-90	$5x10^{-12}$ μC/cc(4)
Iodine	1	Gamma scint		$1.1x10^{-5}-1.1x10^{-11}$ μC/cc I-131	$1.1x10^{-11}$ μC/cc(4)
Gaseous	2	Beta scint (normal range)		$10^{-6}-10^{1}$ μC/cc Kr-85	10^{-6} μC/cc(4)
		Gamma G-M(12) (extended range)		$5-10^{5}$ μC/cc Kr-85	5μC/cc

TABLE 11.3 (cont) (Page 2 of 5)

RMS Identific Description and Ref.	Number of Channels	Detector Type(15)(16)	Detector Location(17)	Range	Minimum Detectable Concentration(1)
South plant vent(11) 11.5.2.2.2			Sample panel El. 155, Area 32		
Particulates	1	Beta scint		$5x10^{-12}$ - $1x10^{-6}$ μC/cc Sr-90	$5x10^{-12}$ μC/cc(4)
Iodine	1	Gamma scint		$1.1x10^{-9}$-$1.1x10^{-11}$ μC/cc I-131	$1.5x10^{-11}$ μC/cc(4)
Gaseous	2	Beta scint (normal range)		10^{-6}-10^{1} μC/cc Kr-85	10^{-6} μC/cc (4)
		Gamma G-M(12) (extended range)		5-10^{5} μC/cc Kr-85	5μC/cc
Filtration, recirculation ventilation system(6) 11.5.2.2.3	2		Sample panel El. 153, Area 72		
Gaseous		Beta scint (normal range)		10^{-6}-10^{1} μC/cc Kr-85	10^{-6} μC/cc
Gaseous		Gamma G-M (extended range)		5-10^{5} μC/cc Kr-85	5 μC/cc
Cooling tower blowdown 11.5.2.2.4	1	Gamma scint	Effluent to Delaware R Building 9	10^{-7}-10^{-2} μC/cc Cs-137	$1x10^{-7}$ μC/cc (5)
Liquid radwaste 11.5.2.2.5	1	Gamma scint	Shielded sampler El. 58, Area 35	$5.8x10^{-7}$-$5.8x10^{-2}$ μC/cc Cs-137	$5.8x10^{-7}$ μC/cc(4)
Offgas 11.5.2.2.6	2	Gamma ion chamber	Inlet to sample panel OC-335/J034 El. 87, Area 36	1-10^{6} mR/h	1 mR/h
Offgas treatment system 11.5.2.2.7	2	Gamma scint	Downstream of outlet HEPA filter, at sampler El. 54, Area 38	$1.5x10^{-5}$-1.5 μC/cc Kr-85	$1.5x10^{-5}$ μC/cc

RMS Identific Description and Ref.	Number of Channels	Detector Type[15][16]	Detector Location[17]	Range	Minimum Detectable Concentration[1]
Reactor building ventilation system exhaust 11.5.2.2.8	1	Beta scint	Downstream of HEPA & charcoal filters El. 165, Area 32	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc
Turbine building exhaust 11.5.2.2.9	1	Beta scint	Upstream of junction with south stack El. 171, Area 10	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc at 2.5 mR/h MPP[7]
Turbine building compartment exhaust 11.5.2.2.10	1	Beta scint	Upstream of junction with turbine bldg exhaust El. 158, Area 12	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc at 2.5 mR/h MPP[7]
Radwaste exhaust system 11.5.2.2.11	1	Beta scint	Downstream of filters El. 175, Area 32	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc
Radwaste area exhaust 11.5.2.2.12	1	Beta scint	Upstream of filters El. 164, Area 35	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc
Gaseous radwaste area exhaust 11.5.2.2.13	1	Beta scint	Recombiner exhaust duct El. 70, Area 35	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc at 2.5 mR/h MPP[7]
Technical support center ventilation 11.5.2.2.14	1	Beta scint	Air inlet plenum El. 162, Area 73	$5x10^{-6}$-10^{-1} µC/cc Kr-85	$5x10^{-6}$ µC/cc
Drywell leak detection 11.5.2.2.15	1	Beta scint	Sample panel El. 162, Area 17	10^{-6}-10^{-1} µC/cc Kr-85	$1x10^{-6}$ µC/cc at 2.5 mR/h MPP[7][8][9]
Reactor auxiliaries cooling system 11.5.2.2.16	1	Gamma scint	Shielded sampler El. 77, Area 23	$5.4x10^{-7}$-$5.4x10^{-2}$ µCi/cc Cs-137	$5.4x10^{-7}$ µC/cc at 2.5 mR/h MPP[7][8]
Safety auxiliaries cooling system 11.5.2.2.17	2	Gamma scint	Shielded sampler El. 102, Area 23	$5.4x10^{-7}$-$5.4x10^{-2}$ µCi/cc Cs-137	$5.4x10^{-7}$ µC/cc at 2.5 mR/h MPP[7][8]

TABLE 11.3 (cont) (Page 4 of 5)

RMS Identific Description, and Ref.	Number of Channels	Detector Type(15)(16)	Detector Location(17)	Range	Minimum Detectable Concentration(1)
Heating steam condensate, waste 11.5.2.2.18	1	Gamma scint	Shielded sampler El. 94, Area 32	5.4×10^{-7}-5.4×10^{-2} μC/cc Cs-137	5.4×10^{-7} μC/cc at 2.5 mR/h MFP(7)
Heating steam condensate, decontamination 11.5.2.2.19	1	Gamma scint	Shielded sampler El. 54, Area 35	5.4×10^{-7}-5.4×10^{-2} μC/cc Cs-137	5.4×10^{-7} μC/cc at 2.5 mR/h MFP(7)
Turbine building circulating water 11.5.2.2.20	1	Gamma scint	Shielded sampler El. 58, Area 01	5.8×10^{-7}-5.8×10^{-2} μC/cc Cs-137	5.8×10^{-7} μC/cc at 2.5 mR/h MFP(7)

----

(1) Minimum detectable concentration with the detector in a 1 mR/h field unless stated otherwise.

(2) Deleted

(3) Deleted

(4) The 10 CFR 50 Appendix I release monitoring function is performed by the NPV RMS and SPV RMS, and the liquid radwaste.

(5) The expected MFP concentrations are not expected to be measurable by the CTB RMS. Because the cooling tower will concentrate the river water by factors of 5-10, the naturally occurring K-40 concentration in the blowdown released back to the river can be as high as 1×10^{-7} μC/cc or about 200 times greater than the plant releases of gamma emitters.

(6) Particulates and halogens are sampled and removed for onsite analysis

(7) MFP = Mixed fission products.

(8) Mixed fission products, reactor water.

(9) Mixed fission products, reactor steam.

(10) Mixed fission products, initial post-LOCA drywell atmosphere.

(11) Particulates and halogens above normal range are sampled and removed for onsite analysis.

(12) The NPV RMS and SPV RMS gaseous monitors include an extended range monitor in order to comply with the Regulatory Guide 1.97, Revision 2, Table 1, Type E variable for other identified releases sources. The RMS are Category 2.

(13)This detector is calibrated in mR/h. The MSL-RMS function is to detect major failures in the fuel cladding. Under normal conditions the fission products from fuel leakage will be masked by several orders of magnitude by the reactor coolant products.

(14)This detector is calibrated in mR/h. The function of the DAPA-RMS is to provide a radiation evaluation of the containment atmosphere during postulated post-accident conditions.

(15)Detector check sources are as follows:

Detector type	Check source isotope	Quantity in microcuries
Liquid and iodine (gamma scint)	Cs - 137	9
Gaseous (beta scint)	Cl - 36	9
Gaseous, extended range (gamma G-M)	Sr - 96	0.1
DAPA-RMS	U-234/238	6.6E-5 (keep-alive source)

(16) The calibration transfer sources will be purchased by the supplier early in 1984. These transfer sources will be traceable to the National Bureau of Standards (NBS) either by direct NBS calibration or by comparison to NBS calibrated sources.

(17) See Figure 1.2-44 for the plant area designations.

15.7.3 Postulated Radioactive Releases Due to Liquid Tank Failures

According to the Standard Review Plan, the radioactivity in liquid tanks outside the containment should be limited so that a tank rupture will not result in radioactivity concentrations at the nearest drinking water source in excess of 10 CFR Part 20, Appendix B, Table II, Column 2 limits. The hydrologic characteristics of the Hope Creek site are such that any spilled liquid on top of the ground (such as from rupture of the condensate storage tank) or released via perculation through the ground (such as rupture of the waste evaporator concentrate hold tank and subsequent failure of the concrete floors housing the tanks within the radwaste building) will only be received by the salt water of the Delaware Estuary. Consequently, there are no fresh water drinking water sources that can be contaminated by spilled radioactive liquids. Accordingly, the staff has not performed a liquid radwaste tank failure analysis because the Hope Creek site satisfies the requirements (i.e., there is no fresh drinking water source that can be contaminated).