WordPerfect Document Compare Summary

Original document: P:\RG 1.206 draft\C.I.11.wpd
Revised document: @PFDesktop\:MyComputer\C:\ADAMS\Cache\ML0624903190.wpd
Deletions are shown with the following attributes and color:
~~Strikeout~~, Blue RGB(0,0,255).
Deleted text is shown as full text.
Insertions are shown with the following attributes and color:
Double Underline, Redline, Red RGB(255,0,0).

The document was marked with 394 Deletions, 393 Insertions, 0 Moves.

C.I.~~11. Radioactive~~11 Radioactive Waste Management

Chapter 11 of the final safety analysis report (FSAR) should describe the capabilities of the plant to control, collect, handle, process, store, and dispose of liquid, gaseous, and solid wastes that may contain radioactive materials, and the instrumentation used to monitor and control the release of radioactive effluents and wastes.

The information should cover normal operation, including anticipated operational occurrences (AOOs) (e.g., refueling, purging, equipment downtime, maintenance~~, etc.~~). The proposed radioactive waste (radwaste) treatment systems should have the capability to meet the requirements of ~~10 CFR Parts 20 and 50~~Title 10, Part 20, "Standards for Protection Against Radiation," of the *Code of Federal Regulations* (10 CFR Part 20) and 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and the recommendations of appropriate regulatory guides concerning system design, control, and monitoring of releases, and to maintain releases of radioactive materials at the ~~"as~~"as low as is reasonably achievable~~"~~" (ALARA) level in accordance with Appendix I "Numerical Guides for Design Objectives and Limiting Conditions for Operations to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," to 10 CFR Part 50. As warranted, this chapter should specifically reference needed information that appears in other chapters of the FSAR.

C.I.11.1 *Source Terms*

This section addresses the sources of radioactivity that are generated within the core and have the potential of leaking to the reactor coolant system (RCS) during normal plant operation, including ~~anticipated operational occurrences (~~AOOs~~)~~, by way of defects in the fuel cladding.

~~P~~The applicant should provide two source terms for (1) the primary coolant and reactor steam for boiling-water reactor (BWRs~~,~~) and (2) primary and secondary coolants for pressurized-water reactor (PWR) plants. The first source term is a conservative or design-basis source term which assumes a design-basis fuel defect level. ~~P~~The applicant should provide the design-basis reactor primary and secondary coolant fission, activation, and corrosion product activities. The reactor core fission product inventories are determined based on time-dependent fission product core inventories that are calculated by the ORIGEN code. The first source term serves as a basis for (1) radwaste system design capability to process radioactive wastes at design-basis fuel defect level and fission product leakage level, (2) ~~confirmation~~ confirmation of compliance with radioactive gaseous and liquid effluent release standards and effluent monitoring requirements under routine operations and ~~anticipated operational occurrences~~AOOs, and (3) shielding requirements and compliance with occupational radiation exposure limits.

The second source term is a realistic model which represents the expected average concentrations of radionuclides in the primary and secondary coolant. ~~P~~The application should provide realistic reactor primary and secondary coolant fission, activation, and corrosion product activities. The supporting information should describe expected liquid and gaseous source terms by plant systems, transport or leakage mechanisms, system flow rates, applicable radionuclide partitioning and decontamination factors, ~~etc.,~~ and release pathways. For PWRs, the applicant should provide these activities in the steam generator secondary side for the liquid and steam phases. The~~se values~~ applicant should ~~be determined~~ determine these values using the model in ~~ANSI/ANS 18.1-1999, NUREG-0016 (BWR-GALE code), and NUREG-0017 (PWR-GALE code)~~American National Standards Institute/American Nuclear Society (ANSI/ANS) 18.1-1999, "Radioactive Source Term for Normal Operation of Light-Water Reactors," NUREG-0016, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWRs)," and NUREG-0017, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors (PWRs)."

The realistic source term provides the bases for estimating typical concentrations of the principal radionuclides. This source term model reflects the industry experience at a large number of operating reactor plants. The realistic source term is used to calculate the quantity of radioactive materials released annually in liquid and gaseous effluents during normal plant operation, including AOOs, to demonstrate compliance with ~~10 CFR Part 20, Appendix B, Table 2~~the liquid and gaseous effluent concentration limits~~, 10 CFR 20.1302 dose limits~~, in Table 2 of Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," to10 CFR Part 20; the dose limits in 10 CFR 20.1301, "Dose Limits for Individual Members of the Public"; the compliance requirements in 10 CFR 20.1302, "Compliance with Dose Limits for Individual Members of the Public";and the ALARA design objectives of Appendix I to 10 CFR Part 50.

Describe the mathematical models and parameters used for developing these two source terms to determine the specific activity and concentration of each radionuclide in the primary coolant and secondary coolant. Justify all assumptions. Demonstrate that the models and parameters used are consistent with NUREG-0016 ~~(BWRs)~~ or NUREG-0017 ~~(PWRs)~~ and the guidance provided in ANSI/ANS 18~~1~~1-1999 and Regulatory Guide 1.112, "Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluent from Light-Water-Cooled Power Reactors" If this guidance is not followed, describe the specific alternative methods used.

In determining the concentrations of activation and corrosion products used in the source term calculations, take into account the activation of water and constituents normally found in the~~reactor coolant system~~RCS. Identify the source of each radionuclide (e.g., tritium,~~C-14~~carbon-14, ~~Ar-41~~argon-41, ~~N-16~~nitrogen-16), and indicate the concentration of each radionuclide. Provide the bases for all assumptions and parameters used, including all supporting references. Cite any previous pertinent operating experience, and its use as a supporting basis. The reactor coolant corrosion product and activation activities should be based on operating plant data and are independent of fuel defect level.

The source terms included in this section of the~~R~~regulatory ~~G~~guide have a driving influence in establishing the design capacities and performance of radioactive waste management systems addressed in ~~Section 11.2 (Liquid Waste Management Systems), Section 11.3 (Gaseous Waste Management System), Section 11.4 (Solid Waste Management System), and Section 11.5 (Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems)~~Sections 11.2, 11.3, 11.4, and 11.5 Similarly, the source terms included in this section of the~~R~~regulatory ~~G~~guide are used to assess shielding requirements and occupational radiation exposures, as addressed in Section 12. Accordingly, analytical models, model assumptions, and system parameters used in developing source terms described in this section should be complete in their descriptions and include their technical bases to facilitate the agency's review and evaluation of Sections 11.2, 11.3, 11.4, 11.5, and 12.

C.I.11.2 ***Liquid Waste Management Systems***

In this section, describe the capabilities of the plant to monitor, control, collect, process, handle, store, and dispose of liquid radioactive waste generated as the result of normal operation, including ~~anticipated operational occurrences~~AOOs, using the guidance of NUREG-0016~~(BWRs) or NUREG-0017 (PWRs).~~

~~Process~~or NUREG-0017, and Regulatory Guide 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures and Components in Light-Water-Cooled Nuclear Reactor Power Plants," as it applies to the liquid waste management systems (LWMS).

Section 11.5 should describe processand effluent radiological monitoring, instrumentation and sampling systems ~~should be described in Section 11.5,~~ using the information contained in this section and in Chapter 9 of the FSAR.

C.I.11.2.1 Design Bases

Describe the ~~liquid management system~~LWMS (i.e., liquid radioactive waste handling and treatment systems) design, design objectives, design criteria, and methods of treatment in terms of expected annual quantities of radioactive material (by radionuclide) released, averaged over the life of the plant, and in terms of the expected doses to individuals at or beyond the site boundary. Describe the principal parameters used in calculating the releases of radioactive materials in liquid effluents using NUREG-0016 ~~(BWRs)~~ or NUREG-0017 ~~(PWRs)~~ and Regulatory Guide 1.112. If this guidance is not followed, describe the specific alternative methods used.

Include an evaluation that demonstrates the capability of the proposed systems to control releases of radioactive materials within the numerical design objectives of Appendix I to 10 CFR Part 50 and ~~10 CFR Part 20, Appendix B,~~ the effluent concentration limits of Appendix B to 10 CFR Part 20.

Within this evaluation, provide a site-specific cost-benefit analysis for reducing population doses due to liquid effluents, pursuant to Appendix I to 10 CFR Part 50, ~~Appendix I,~~ and in accordance with the guidance in Regulatory Guides 1.110 ~~and 1.113~~, "Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Plants," and 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," and NUREG/CR-4013, "LADTAP II—Technical Reference and User Guide." If this guidance is not followed, describe the specific alternative methods used. More specifically, show that the proposed systems contain all items of reasonably demonstrated technology that, when added to the system in order of diminishing cost-benefit return, can, for a favorable cost-benefit ratio, effect reductions in dose to the population reasonably expected to be within 50 miles of the reactor. State all assumptions and describe the calculational methods used, including all supporting references.

Also provide an evaluation ~~which~~that shows that the proposed systems have sufficient capacity, redundancy, and flexibility to meet the concentration limits ~~of 10 CFR Part 20, Appendix B~~ in Table 2, Column 2, of Appendix B to 10 CFR Part 20, during periods of equipment downtime and during operation at design-basis fission product leakage levels ~~[~~(i.e., for a PWR, leakage from fuel producing ~~one~~1 percent of the reactor power or, for a BWR, fuel having a noble gas release rate of 3.7 MBq/~~sc~~ per MWt (100 µCi/s~~ec~~ per MWt) measured after a 30-minute delay~~]~~).

List the liquid radwaste system components and their design parameters (e.g., design and expected flows, design and expected temperatures, design and expected pressures, materials of construction, capacities, expected radionuclide concentrations, expected decontamination factors for radionuclides ~~and~~ available holdup times). Also include an evaluation indicating the capabilities of the system to process surge waste flow rates associated with ~~anticipated operational occurrences~~AOOs, such as anticipated waste flows from back-to-back refueling and equipment downtime. This evaluation should take into account the period of time that the system is required to be in service to process normal waste flows, the availability of standby equipment, alternate processing routes, and interconnections between subsystems. Discuss system capability to process wastes in the event of a single major equipment item failure (e.g., an evaporator outage). Discuss system capability to accept additional wastes during operations that result in ~~excessive~~peak liquid waste generation.

Indicate system design capacity relative to the design and expected input flows, and the period of time the system is required to be in service to process normal waste flows. Describe design features implemented to preclude placing the components and structures of the system under adverse vacuum conditions.

Discuss any mobile or temporary equipment used for storing or processing liquid radwaste in accordance with Regulatory Guide 1.143. (For example, this includes discussion of equipment containing radioactive liquid radwaste in the non-seismic radwaste building.) If this guidance is not followed, describe the specific alternative methods used. Describe system design features and operational procedures used to ensure that interconnections between plant systems and mobile processing equipment will avoid the contamination of non-radioactive systems and uncontrolled releases of radioactivity in the environment (see IE Bulletin No. 80-10(BL)-80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity in the Environment," dated May 6, 1980, and Regulatory Guide 1.11, "Instrument Lines Penetrating Primary Reactor Containment,for details). Discuss system capability of and requirements for utilizingportablemobile processing equipment for refueling outages.

Provide the seismic design criteria, the bases governing chosen criteria, and the analytical procedures for equipment support elements and structures housing the liquid radwaste components. Also, provide the quality group classifications for the liquid radwaste treatment components, equipment, and piping. SThe application may incorporate seismic and quality group classifications provided in Section 3.2 may be incorporated by reference. Describe how the requirements of General Design Criteria (GDC) 60, 61, and 64 of Appendix A to 10 CFR Part 50"Control of Releases of Radioactive Materials to the Environment," GDC 61, "Fuel Storage and Handling and Radioactivity Control," and GDC 64, "Monitoring Radioactivity Releases," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 will be implemented in monitoring and controlling effluent releases.

Describe the design features incorporated to reduce maintenance, equipment downtime, and liquid leakage or gaseous releases of radioactive materials to the building atmosphere. Describe the design features incorporated to facilitate cleaning or otherwise improve radwaste operations in accordance with the guidance of Regulatory Guides 1.140 "Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," and 1.143. If this guidance is not followed, describe the specific alternative methods used. Describe design features, including decontamination factors, that would reduce liquid input volumes or discharge of radioactive material in liquid effluents. If decontamination factors for vented gaseous wastes are different thanfrom those in Regulatory Guide 1.140, provide the supporting test data or description of simulated operating conditions (i.e., temperature, pressure, humidity, expected iodine concentrations, and flow rates). If not addressed here,in this section, Section 11.3 should presentthe related discussions and supporting technical informationshould be presented in Section 11.3.

Describe the design features incorporated to prevent, control, and collect the release of radioactive materials due to overflows from all liquid tanks outside containment that could potentially contain radioactive materials. Discuss the effectiveness of both the physical and the monitoring precautions taken (e.g., dikes, level gauges,and automatic diversion of wastes from tanks exceeding a predetermined level). Discuss the potential for an operator error or equipment malfunction (single failures) to result in uncontrolled and unmonitored releases to the environment. Describe the design provisions and controls provided to preclude inadvertent or uncontrolled releases of radioactivity to the environs and consequences of potential releases of radioactive materials to a potable water supply systemusing the guidance of SRP Branch Technical Position (BTP) 11-6, "Postulated Radioactive Releases Due to Liquid-Containing Tank Failures."

Describe the quality assurance procedures and indicate consistency with the guidance of Regulatory Guides 1.143 and 1.33 "Quality Assurance Program Requirements (Operations)." If this guidance is not followed, describe the specific alternative methods used. Reference Chapter 17 of the FSAR, as appropriate.

Discuss inspection and testing provisions implemented to enable periodic evaluation of system operability and required functional performance in accordance with the guidance of Regulatory Guide 1.143. If this guidance is not followed, describe the specific alternative methods used.

In accordance with the requirements of 10 CFR 20.1406, "Minimization of Contamination," describe how the above design features and operational procedures will minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

Also include a discussion of any special design features that may be unique to the plant, topical reports incorporated by reference, and data obtained from previous experience with similar equipment and methods, and their use as a supporting basis.

C.I.11.2.2 System Description

Describe each liquid waste subsystem and the process flow diagrams indicating processing equipment, normal process routes, equipment capacities, and redundancy in equipment. Reference Chapters 9 and 10 of the FSAR, as appropriate, in the system description. Process flow diagrams should show methods of operation and factors that influence waste treatment (e.g., system interfaces and potential bypass routes to non-radioactive systems or unmonitored releases). For multi-unit stations, indicate those subsystems that are shared. Identify all equipment and components that will normally be shared between subsystems. Indicate the processing to be provided for all liquid radwaste, including turbine building floor drains, and in the case of a PWR, steam generator blowdown liquids as well as other equipment and components applicable to specific plant designs.

Provide system piping and instrumentation diagrams (P&IDs) and process flow diagrams showing methods of operation and factors that influence waste treatment (e.g., system interfaces and potential bypass routes). For each subsystem, tabulate or show on flow diagrams the maximum and expected inputs in terms of flow (m^3/day or gallons/day g/d per reactor) and radioactivity (fraction of primary coolant activity) for normal operation, including anticipated operational occurrences AOOs. Provide the bases for the values used, including all supporting references.

Include P&IDs which indicate system interconnections and seismic and quality group interfaces. Describe any instrumentation and controls that govern operation. Indicate all potential bypasses of normal process routes, the conditions governing their use, and the anticipated frequency of bypass due to equipment downtime. Describe the segregation of liquid waste streams based on conductivity, radioactivity, and chemical composition, as appropriate. Also, indicate the location of secondary flow paths flowpaths for each system. Describe both the normal operation of each system and the differences in system operation during anticipated operational occurrences AOOs, such as startups, shutdowns, and refueling.

C.I.11.2.3 Radioactive Effluent Releases

Provide the criteria for Describe factors used in determining whether processed liquid wastes will be recycled for reuse or, treated further treated, or discharged to the environment as they relate to maintaining effluent releases ALARA. Discuss the influence of the plant water balance needs and of the expected

tritium concentrations in process streams on the assumed release parameters, including in-plant dilution before the point of release.

Provide the parameters, assumptions, and bases used to calculate releases of radioactive materials in liquid effluents, using Regulatory Guide 1.112 (Appendix A ~~for~~applies to BWRs and Appendix B ~~for~~applies to PWRs). If this guidance is not followed, describe the specific alternative methods used. Provide the expected releases of radioactive materials (by radionuclide) in liquid effluents resulting from normal operation, including ~~anticipated operational occurrences~~AOOs, and from design-basis fuel leakage in MBq/yr (Ci/yr) per reactor. Describe expected release rates of radioactive material from the ~~liquid waste management system~~LWMS, including location of process and effluent radiation monitoring systems, location of release points, effluent temperature, effluent flow rate, and size and shape of flow orifices.

Tabulate the releases by radionuclide for the total system and for each subsystem, and indicate the effluent concentrations. Demonstrate compliance with regulations by comparing the calculated effluents with the concentration limits ~~of 10 CFR Part 20, Appendix B~~ in Table 2, Column 2, of Appendix B to 10 CFR Part 20. Calculate doses to members of the public in unrestricted areas, using the guidance of Regulatory Guides 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," and 1.113. If this guidance is not followed, describe the specific alternative methods used. Compare ~~the~~ doses due to the effluents with the numerical design objectives of Appendix I to 10 CFR Part 50 ~~and the dose limits~~, compliance requirements of 10 CFR 20.1302, and the ~~Environmental~~U.S. Environmental Protection Agency's ~~s~~ (EPA) environmental standards in 40 CFR Part 190 "Environmental Radiation Protection Standards for Nuclear Power Operations," as they apply in Standard Review Plan (SRP) Section 11.5 in determining total dose. Identify all release points of liquid wastes and the dilution factors (in-plant and beyond the point of release) considered in the evaluation. (The dilution factors provided for the activity released depend on site-specific features.)

C.I.11.3 ***Gaseous Waste Management Systems***

In this section, describe the capabilities of the plant to monitor, control, collect, process, handle, store, and dispose of gaseous radioactive waste generated as the result of normal operation and ~~anticipated operational occurrences~~AOOs, using the guidance of NUREG-0016 ~~(BWRs) or NUREG-0017 (PWRs)~~ or NUREG-0017, and Regulatory Guide 1.143, as it applies to the gaseous waste management systems (GWMS).

In this section, the term "~~gaseous~~"gaseous waste systems"" applies to all plant systems having the potential to release radioactive materials in gaseous effluent to the environment, including building ventilation systems. Gaseous wastes include noble gases, halogens, tritium, ~~Ar-41~~argon-41, ~~C-14~~carbon-14, and radioactive material in particulate form. The ~~gaseous waste management system~~GWMS includes the gaseous radwaste system. The gaseous radwaste system serves to manage radioactive gases collected from the offgas system (including charcoal delay beds), waste gas storage and decay tanks, of ~~from~~ vented tanks. In addition, the ~~gaseous waste management system~~GWMS includes management of the condenser air removal system, steam generator blowdown flash tank (if applicable), containment purge exhausts for PWRs, and management of the gland seal exhaust and mechanical vacuum pump operation exhaust for BWRs. The management for gaseous effluents to the environment from the above sources may, in turn, involve treatment systems to reduce releases of radioactive material in the effluents from the above sources.

~~P~~The applicant should describe the process and effluent radiological monitoring systems ~~should be described~~ in Section 11.5, using the information contained in this section and in Chapter 9 of the FSAR.

C.I.11.3.1 Design Bases

Describe the ~~gaseous waste management system~~GWMS design, design objectives, design criteria and methods of treatment in terms of expected annual quantities of radioactive material (by radionuclide) released, averaged over the life of the plant, and the expected doses to individuals at or beyond the site boundary. Describe the principal parameters used in calculating the releases of radioactive materials in gaseous effluents (e.g., noble gases, radioiodine, tritium, ~~C-14~~carbon-14, and particulates) using the guidance of NUREG-0016~~(BWRs)~~ or NUREG-0017~~(PWRs)~~ and Regulatory Guide 1.112. If this guidance is not followed, describe the specific alternative methods used. Also include a description of the design objectives of the plant ventilation systems for normal and emergency operation, including ~~anticipated operational occurrences~~AOOs, with respect to meeting the requirements of 10 CFR Parts 20 and 10 CFR Part 50.

Provide an evaluation showing the capability of the proposed systems to control releases of radioactive materials to within the numerical design objectives of Appendix I to 10 CFR Part 50. Within this evaluation, provide a site-specific cost-benefit analysis for reducing population doses due to gaseous effluents, in compliance with Appendix I to 10 CFR Part 50, ~~Appendix I~~, and in accordance with the guidance in Regulatory Guides 1.110 and 1.111 "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," and NUREG/CR-4653, "GASPAR II—Technical Reference and User Guide." If this guidance is not followed, describe the specific alternative methods used. More specifically, show that the proposed systems contain all items of reasonably demonstrated technology that, when added to the system in order of diminishing cost-benefit return, can, for a favorable cost-benefit ratio, effect reductions in dose to the population reasonably expected to be within 50 miles of the reactor. State all assumptions and describe the calculational methods used, including all supporting references.

Also provide an evaluation which shows that the proposed systems have sufficient capacity, redundancy, and flexibility to meet the concentration limits ~~of 10 CFR Part 20, Appendix B~~ in Table 2, Column 1, of Appendix B to 10 CFR Part 20 during periods of equipment downtime and during operation at design-basis fission product leakage levels ~~(~~i.e., for a PWR, leakage from fuel producing ~~one~~1 percent of the reactor power or, for a BWR, fuel having a noble gas release rate of 3.7 MBq/~~sec~~ per MWt (100 µCi/~~sec~~ per MWt) measured after a 30-minute delay~~)~~.

List the gaseous radwaste system components and their design parameters (e.g., ~~design~~ design and expected flows, design and expected temperatures, design and expected pressures, materials of construction, equipment and ventilation system design capacities, expected radionuclide concentrations, expected decontamination factors for radionuclides, ~~and~~ available holdup times). Provide an evaluation indicating the capabilities of the system to process surge waste flow rates associated with ~~anticipated operational occurrences~~AOOs, such as cold startups, shutdowns, purging of containment, back-to-back refueling, and major processing equipment downtime. This evaluation should take into account the period of time that the system is required to be in service to process normal waste flow rates, availability of standby equipment, alternate processing routes, and interconnections between subsystems. Discuss system capability to process wastes in the event of a single major equipment item failure (e.g., charcoal adsorbers). Discuss system capability to accept additional wastes during operations which result in excessive gaseous waste generation.

Discuss any mobile or temporary equipment used for storing or processing gaseous radwaste in accordance with Regulatory Guide 1.143. If this guidance is not followed, describe the specific alternative methods used. Describe system design features and operational procedures used to ensure that interconnections between plant systems and mobile processing equipment will avoid the contamination of non-radioactive systems and uncontrolled releases of radioactivity in the environment (see IE ~~Bulletin No.~~

80-10BL-80-10 and Regulatory Guide 1.11for details). Discuss system capability of and requirements for utilizing portable processing equipment for refueling outages.

Provide the seismic design criteria, the bases governing chosen criteria, and the analytical procedures pertaining to equipment support elements and structures housing the gaseous waste treatment system. Also, provide the quality group classification for the gaseous waste treatment components, equipment, and piping. Seismic and quality group classifications provided in Section 3.2 may be incorporated by reference. Describe how the requirements of GDC 60, 61, and 64of Appendix A to 10 CFR Part 50 will be implemented in monitoring and controlling effluent releases.

Describe the design features incorporated to reduce maintenance, equipment downtime, leakage of gaseous waste or discharge of radioactive material in gaseous effluents, and gaseous releases of radioactive materials to the building atmosphere. Describe the design features incorporated to facilitate cleaning or otherwise improve radwaste operations, in accordance with the guidance of Regulatory Guide 1.143. If this guidance is not followed, describe the specific alternative methods used.

Describe the process used for the design testing and maintenance ofHEPAhigh-efficiency particulate air filters and charcoal adsorbers installed in ventilation exhaust systems, in accordance with the guidance of Regulatory Guide 1.140. If decontamination efficiencies for iodines are differentthanfrom those in Regulatory Guide 1.140, provide the supporting test data or description of simulated operating conditions (i.e., design and expected temperatures, design and expected pressures, humidity, expected iodine concentrations, and design and expected flow rates). Also, include information and data addressing the effects of aging and positioning on charcoal adsorbers by airborne contaminants.

Describe the design features incorporated to prevent, control, and collect the release of radioactive materials in gaseous effluents due to equipment malfunction or operator error. Discuss the effectiveness of monitoring precautions taken (i.e., automatic termination of waste release from waste gas storage tanks when the release exceeds a predetermined level). Discuss the potential for an operator error or equipment malfunction (single failures) to result in uncontrolled and unmonitored releases of radioactivity to the environment, usingStandard Review Plan (the guidance in SRP) Branch Technical Position (BTP)ETSB 11-5 guidance.11-5, "Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure." Describe the design provisions and controls provided to preclude inadvertent or uncontrolled releases of radioactivity to the environs.

For systems where the potential for an explosion or explosive mixture exists, identify and justify any equipment that is not designed to withstand the pressure peak of the explosion. Describe process instrumentation (including gas analyzers) and design features provided to prevent explosions as well as provisions to ensure that seals will not be permanently damaged or lost following an explosion.

Describe the quality assurance procedures and indicate consistency with the guidance of Regulatory Guides 1.143 and 1.33. If this guidance is not followed, describe the specific alternative methods used. Reference Chapter 17 of the FSAR, as appropriate.

Discuss inspection and testing provisions implemented to enable periodic evaluation of system operability and required functional performance in accordance with the guidance of Regulatory Guide 1.143. If this guidance is not followed, describe the specific alternative methods used.

In accordance with the requirements of 10 CFR 20.1406, describe how the above design features and operational procedures will minimize, to the extent practicable, contamination of the facility and the

environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

Also include a discussion of any special design features that may be unique to the plant, topical reports incorporated by reference, and data obtained from previous experience with similar equipment and methods.

C.I.11.3.2 System Description

Describe each gaseous waste subsystem and the process flow diagrams, indicating processing equipment, normal ~~flow paths~~flowpaths through the system, equipment capacities, and redundancy in equipment. Reference Chapters 9 and 10 of the FSAR, as appropriate. Process flow diagrams should show methods of operation and factors that influence waste treatment (e.g., system interfaces and potential bypass routes). For multi-unit stations, indicate those subsystems that are shared. Identify all equipment and components that will normally be shared between subsystems.

Provide system P&IDs and process flow diagrams showing methods of operation and factors that influence waste treatment (e.g., system interfaces and potential bypass routes). For each subsystem, tabulate or show on the flow diagrams the maximum and expected inputs in terms of flow (~~m³/minute~~m^3/min or ~~ft³/minute~~ft^3/min) and radioactivity content (fraction of primary coolant activity) for normal operation, including ~~anticipated operational occurrences~~AOOs. Provide the bases for the values used, including all supporting references. Indicate the composition of carrier and blanket gases, and describe the segregation of streams containing hydrogen, if appropriate.

Include P&IDs ~~which~~that indicate system interconnections and seismic and quality group interfaces. Describe any instrumentation and controls that govern operation. Indicate all potential bypasses of normal process routes, the conditions governing their use, and the anticipated frequency of bypass due to equipment downtime. Provide the location of liquid seals, indicated on the P&IDs, and describe how blown seals will be automatically reestablished. Also, indicate the location of vents and secondary ~~flow paths~~flowpaths for each system. Describe both the normal operation of each system and the differences in system operation during ~~anticipated operational occurrences~~AOOs such as startups, shutdowns, refueling, and purging of containment.

Describe all building ventilation systems expected to contain radioactive materials. Include building volumes, expected flow rates from buildings and equipment cubicles, filter characteristics, and the design criteria on which these are based. Describe both the normal operation of each ventilation system and the differences in operation during ~~anticipated operational occurrences~~AOOs such as startup, shutdown, and refueling. Provide a tabulation showing the calculated concentrations of airborne radioactive material (by radionuclide) expected during normal operation and ~~anticipated operational occurrences~~AOOs for equipment cubicles, corridors, and areas normally occupied by operating personnel.

Identify types of adsorbent media to be used in the gaseous radwaste system, and describe bounding operating conditions (e.g., pressure, temperature, humidity, flow rates, residence time ~~, etc.~~).

Describe the subsystems in the steam and power conversion systems that are potential sources of gaseous radioactive effluents (e.g., turbine gland sealing systems, main condenser vacuum system). Provide the flow rates and concentrations of radioactive materials (by radionuclide) through these systems during normal operations and ~~anticipated operational occurrences~~AOOs. Provide the bases for the values used, including all supporting references. Tabulate the expected frequency and quantity of steam released during steam dumps to the atmosphere (PWR) or pressure relief valve venting to the suppression pool (BWR).

Provide the bases for the values used, including all supporting references. Reference other sections of the FSAR, as appropriate.

For plants using offgas treatment systems relying on charcoal beds, provide a description of the offgas treatment system, including number and size of tanks (main and guard) holding charcoals and their locations in plant buildings.

C.I.11.3.3 Radioactive Effluent Releases

Provide the criteria to be used for releasing gaseous wastes and acceptable release rates. Also describe the parameters, assumptions, and bases used to calculate releases of radioactive material in gaseous effluents, using Regulatory Guide 1.112 (Appendix A forapplies to BWRs and Appendix B forapplies to PWRs). If this guidance is not followed, describe the specific alternative methods used. Provide the expected releases of radioactive materials (by radionuclide) in gaseous effluents resulting from normal operation, includinganticipated operational occurrencesAOOs, in MBq/yr (Ci/yr) per reactor.

Tabulate the releases by radionuclide for the total system and each subsystem, and indicate effluent concentrations. Demonstrate compliance with regulations by comparing the calculated effluents with the concentration limits of 10 CFR Part 20, Appendix Bin Table 2, Column 1, of Appendix B to 10 CFR Part 20. Calculate doses to members of the public in unrestricted areas, using the guidance in Regulatory Guides 1.109 and 1.111. If this guidance is not followed, describe the specific alternative methods used. Compare the doses due to the effluents with the numerical design objectives of Appendix I to 10CFR Part 50 and the dose limits, compliance requirementsof 10 CFR 20.1302, and the EPA's environmental standards in 40 CFR Part 190 as they apply in SRP Section 11.5 in determining total dose Indicate the atmospheric dispersion and deposition factors considered in the evaluation. (The atmospheric dispersion and deposition factors provided to assess the presence of airborne radioactivity at downwind locations depend on site-specific features.)

Identify all release points of gaseous waste to the environment and locations of process and effluent radiation monitoring systems on process flow diagrams, general arrangement drawings, or site plot plan. For release points, give the following information

(1) Hheight of release (both height above grade and height relative to adjacent buildings)
(2) Iinside dimensions of release point exit
(3) Eeffluent temperature,
(4) Eeffluent flow rate,
(5) Eeffluent exit velocity, and
(6) Ssize and shape of flow orifices

C.I.11.4 *Solid Waste Management System*

In this section, describe the capabilities of the plant to monitor, control, collect, process, handle, package, and temporarily store prior to shipment wet, dewatered, and dry solid radioactive waste generated as a result of normal operation, includinganticipated operational occurrencesAOOs, using the guidance of Regulatory Guide 1.143, as it applies to the solid waste management system (SWMS).

In this section, the term "solid"solid waste management system" implies a permanently installed system and/or the use of mobile system(s)with skid-mounted waste processing equipmentconnected to plant systems via temporary connections(e.g., flexible hoses and hose connections) A solid waste management systemn SWMS includes slurry waste collection and settling tanks, spent resin storage tanks,

phase separators, and components and subsystems used to dewater or solidify radwaste prior to storage or offsite shipment.

PSection 11.5 should describe process and effluent radiological monitoring systems~~should be described in Section 11.5,~~ using the information contained in this section and in Chapters 9 and 10 of the FSAR.

C.I.11.4.1. Design Bases

Describe the solid radioactive waste handling and treatment system design, design objectives, design criteria, and methods of treatment in terms of the types of wet and dry wastes to be processed (e.g., sludges, resins, evaporator bottoms, and dry materials such as contaminated tools, equipment, rags, plastic, filters, glass, paper, spent charcoals, ~~and~~ clothing and personal protective equipment), the maximum and expected and design volumes to be handled and processed, and the becquerel (curie) and radionuclide content (the activity and expected radionuclide distribution contained in the waste).

Within this evaluation, provide a site-specific cost-benefit analysis for reducing population doses due to radioactive material from the~~solid waste management system~~SWMS, in compliance with 10 CFR 50.34a, "Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents—Nuclear Power Reactors"(Appendix I), and in accordance with the guidance in Regulatory Guide 1.110. If this guidance is not followed, describe the specific alternative methods used. More specifically, show that the proposed systems contain all items of reasonably demonstrated technology that, when added to the system in order of diminishing cost-benefit return, can, for a favorable cost-benefit ratio, effect reductions in dose to the population reasonably expected to be within 50 miles of the reactor. State all assumptions and describe the calculational methods used, including all supporting references.

Discuss any mobile or temporary equipment used for storing or processing solid radwaste in accordance with the guidance in Regulatory Guide 1.143and ANSI/ANS 40.37-200x (draft), "Mobile Low-Level Radioactive Waste Processing Systems." If this guidance is not followed, describe the specific alternative methods used. Describe system design features and operational procedures used to ensure that interconnections between plant systems and mobile processing equipment will avoid the contamination of non-radioactive systems and uncontrolled releases of radioactivity in the environment (see IE~~Bulletin No. 80-10~~BL-80-10 and Regulatory Guide 1.11for details).

Provide the seismic design criteria, the bases governing chosen criteria, and the analytical procedures pertaining to equipment support elements and structures housing the solid radwaste system, including dedicated onsite radioactive waste storage facilities. Also, provide the quality group classification for the solid radwaste treatment components, equipment, and piping.~~S~~The applicant may incorporate seismic and quality group classifications provided in Section 3.2~~may be incorporated~~ by reference. Describe how the requirements of 10 CFR~~Parts 20, 50, 61, and 71,~~ Part 20, 10 CFR Part 50, 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," and 10 CFR Part 71, "Packaging and Transportation of Radioactive Material," and applicable U.S. Department of Transportation (DOT) regulations under 49 CFR Parts 171 – 180 will be implemented, and to what extent the guidance in SRP BTP~~ETSB~~ 11-3, "Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants," Appendix 11-4-A to SRP Section 11.4 will be followed.

Describe the design features incorporated to reduce maintenance, equipment downtime, leakage and discharge of radioactive material.

Describe the design features incorporated to facilitate ~~cleaning~~ radioactive decontamination or otherwise improve radwaste operations, in accordance with the guidance of Regulatory Guide 1.143 and ANSI/ANS-40.37-200x (draft). If this guidance is not followed, describe the specific alternative methods used.

Describe the design features incorporated to prevent, control, and collect the release of radioactive materials due to overflows from tanks containing liquids, sludges, spent resins ~~etc~~ and other waste. Identify all tanks or equipment that use compressed gases for any function and provide information as to gas flow rates, amounts, or volumes per operation; expected number of operations per year; expected radionuclide concentration of offgases; treatment provided; and interfaces with ventilation exhaust systems. Discuss the effectiveness of the physical and monitoring precautions taken (e.g., retention basins, curbing, level gauges). Also discuss the potential for an operator error or equipment malfunction (single failures) to result in uncontrolled and unmonitored releases of radioactive material.

Describe the quality assurance procedures and indicate consistency with the guidance of Regulatory Guides 1.143 and 1.33. If this guidance is not followed, describe the specific alternative methods used. Reference Chapter 17 of the FSAR, as appropriate.

Discuss inspection and testing provisions implemented to enable periodic evaluation of system operability and required functional performance in accordance with the guidance of Regulatory Guide 1.143. If this guidance is not followed, describe the specific alternative methods used.

In accordance with the requirements of 10 CFR 20.1406, describe how the above design features and operational procedures will minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

Also, include a discussion of any special design features that may be unique to the plant, topical reports incorporated by reference, data obtained from previous experience with similar equipment and methods, and their use as a supporting basis.

C.I.11.4.2 System Description

C.I.11.4.2.1 ***Dry Solid Waste***

Describe the dry solid waste subsystem to be used for processing dry filter media (e.g., ventilation filters, charcoal media ~~, etc.~~), contaminated clothing, equipment, tools, and glassware, and miscellaneous radioactive wastes not amenable to ~~solidification~~ stabilization prior to packaging. ~~D~~If adopted as an operational practice, describe the use of sorting methods and waste volume reduction technologies, such as shredders, crushers, and compactors. List the system components and their design parameters, including design capacities and construction materials. Tabulate the maximum and expected waste inputs in terms of type (e.g., filters, tools), sources of waste, volume, and radionuclide and becquerel (curie) content. Provide the bases for the values used, including all supporting references. ~~Indicate~~ If adopted as an operational practice, indicate what fraction, if any, of all solid waste processing will be contracted out to waste brokers or specialized facilities. Describe the disposition of solid wastes generated by the plant once processed in such a manner. Indicate whether such processed wastes will be returned to the plant for subsequent disposal or will be shipped directly by the processor to an authorized low-level radioactive waste disposal facility under 10 CFR Part 61 or equivalent Agreement State regulations.

For plants using offgas treatment systems relying on charcoal beds~~provide a description of the offgass treatment system, including number and size of tanks (main and guard) holding charcoals, their locations in plant buildings, and~~describe provisions for storing spent charcoals prior to shipment~~and~~ include descriptions of proposed storage locations in plant buildings. Describe the radiological and physical properties of spent charcoals. Describe provisions for managing and shipping spent charcoal for disposal. Provide estimates of the project annual amounts (kg/yr, m^3/yr) of spent charcoal that will be shipped as radioactive waste.

C.I.11.4.2.2 ***Wet Solid Waste***

Describe ~~the method and solidification media to be used for solidifying each waste type, the type~~methods and media used to stabilize (e.g., solidification or encapsulation) each type of waste, the types of container in which~~the~~ wastes will be packaged, and the means to be used to ensure the absence of free liquid in ~~the~~ waste containers, including~~the~~a process control program (PCP) to ensure the production of a solid waste matrix. Describe system design features and operational procedures used to ensure that interconnections between plant systems and mobile processing equipment will avoid the contamination of non-radioactive systems and uncontrolled releases of radioactivity in the environment (see I~~Bulletin No. 80-10~~BL-80-10 and Regulatory Guide 1.1 for details).

Describe methods ~~for solidification (i.e., removal of free water)~~applied in stabilizing wet wastes, including the method for dewatering, the~~solidifying~~stabilization or encapsulation agent used, and the implementation of a ~~process control program~~PCP to ensure a solid waste matrix, proper waste form characteristics, and/or complete dewatering (i.e., removal of free water) ~~Indicate~~If adopted as an operational practice, indicate what fraction, if any, of all wet waste processing will be contracted out to waste brokers or specialized facilities. Describe the disposition of processed wet wastes generated by the plant once processed in such a manner. Indicate whether such processed wastes will be returned to the plant for subsequent disposal or will be shipped directly by the processor to an authorized low-level radioactive waste disposal facility under 10 CFR Part 61 or equivalent Agreement State regulations.

Demonstrate compliance of the PCP with 10 CFR 61.55, "Waste Classification," and 10 CFR 61.56, "Waste Characteristics," for wet solid wastes. Include in the discussion the use of mobile systems and provide the PCP demonstrating conformance to Generic Letter (GL) 80-09, "Low Level Radioactive Waste Disposal," dated January 29, 1980, and GL 81-039, "NRC Volume Reduction Policy," dated November 30, 1981, and consistency with the guidance in Regulatory Guide 1.143 and ANSI/ANS 40.37-200x (draft). If this guidance is not followed, describe the specific alternative methods used. Provide information concerning wet solid wastes contained in nonseismic radwaste buildings. In the event that additional onsite storage facilities are a part of combined license applications, include a discussion of conformance to GL 81-038, "Storage of Low Level Radioactive Waste at Power Reactor Sites," dated November 10, 1981, and SECY-93-323, "Withdrawal of Proposed Rulemaking to Establish Procedures and Criteria for On-Site Storage of Low-Level Radioactive Waste after January 1, 1996," (issued under a staff requirements memorandum dated February 1, 1994).

C.I.11.4.2.3 ***Packaging, Storage, and Shipping***

Describe the method of packaging and equipment to be used, along with the provisions for controlling airborne radioactivity due to aerosols generated during processing (e.g., compaction operation). Discuss the methods of handling and packaging large waste materials and equipment that have been activated during reactor operation (e.g., core components). If adopted as an operational practice, indicate what fraction, if any, of all waste processing will be contracted out to waste brokers or specialized facilities. Describe the disposition of ~~processed wet and liquid~~all wastes generated by the plant once processed in such a manner. Indicate whether such processed wastes will be returned to the plant for subsequent

disposal or will be shipped directly by the processor to an authorized low-level radioactive waste disposal facility under 10 CFR ~~Part 61~~Part 61 and 10 CFR Part 71 or equivalent Agreement State regulation~~s~~

~~Demonstrate the compliance of the process control program with 10 CFR §§ 61.55 and 61.56 for wet solid wastes, 10 CFR Part 71, and applicable U.S. DOT regulations (49 CFR Parts 171 - 180). Include in the discussion the use of mobile systems and provide the process control program demonstrating conformance to GL-80-009 and GL-81-039 and consistency with the guidance in Regulatory Guide 1.143. If this guidance is not followed, describe the specific alternative methods used. Provide information concerning wet solid wastes contained in non-seismic radwaste buildings. In the event that additional onsite storage facilities are a part of COL applications, include a discussion of conformance to GL-81-038.~~

~~***Packaging, Storage and Shipping***~~

~~Describe the method of packaging and equipment to be used, along with the provisions for controlling airborne radioactivity due to aerosols generated during compaction and baling operations. Discuss the methods of handling and packaging large waste materials and equipment that have been activated during reactor operation (e.g., core components). Indicate what fraction, if any, of all waste processing will be contracted out to waste brokers or specialized facilities. Describe the disposition of all wastes generated by the plant once processed in such a manner. Indicate whether such processed wastes will be returned to the plant for subsequent disposal or will be shipped directly by the processor to an authorized low-level radioactive waste disposal facility under 10 CFR Parts 61 and 71 or equivalent Agreement State regulations~~, including applicable ~~U.S.~~ DOT regulations under 49 CFR Parts 171~~ - ~~–180.

Provide a discussion addressing the expected distribution of Class A, B, C, and greater-than-class C wastes expected to be generated under the provisions of ~~Part~~10 CFR 61.55. Provide a discussion of the expected waste characteristics shipped for disposal under the provisions of ~~Part~~10 CFR 61.56. Provide a discussion on how waste acceptance criteria of radioactive waste disposal facilities will be met using facility operating procedures and ~~process control program~~PCP.

Describe compliance with Appendix G "Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests," to 10 CFR Part 20 in addressing requirements for the transfers and manifesting of radioactive waste for disposal at authorized facilities.

Describe the typical type and size of containers to be used for packaging wastes and indicate compliance with 10 CFR Part 71 and 49 CFR Parts 171~~ - ~~–180.

Describe the method of filling and handling~~,~~ radwaste containers and monitoring ~~for~~methods used to determine removable radioactive contamination in compliance with the limits of 49 CFR 173.443 "Contamination Control," and external radiation levels in compliance with 49 CFR 173.441 "Radiation Level Limitations and Exclusive Use Provisions."

Describe provisions for onsite storage of radioactive waste in response to Appendix ~~11.4-A of the Standard Review Plan~~A, "Radiological Safety Guidance for Onsite Contingency Storage Capacity," to the SRP Section 11.4. The SRP considers the need to establish onsite storage capabilities for several years ~~(up to 5 years)~~, with an emphasis on the future availability or accessibility to ~~low -level~~low-level waste disposal sites, and safety considerations in the storing, handling, and eventual disposition of radioactive wastes. Provide layout drawings of the packaging, storage, and shipping areas.

Discuss provisions for ~~packing, sealing, decontaminating, and~~ moving ~~the~~ waste containers to storage and shipping areas. Also discuss the potential for loss of radioactive ~~spills~~ contents due to dropping containers from cranes, forklifts, monorails, ~~etc~~ and other equipment. Describe provisions for collecting and processing ~~decontamination liquids and spillage~~ any lost contents and decontaminating containers. Describe provisions for waste storage prior to shipping, including storage provisions, storage capacity, and ~~expected onsite storage time. Describe the expected and design volumes, the expected radionuclide contents, and the design bases for these values, including all supporting references. Provide layout drawings of the packaging, storage, and shipping area~~ similar information.

Indicate the maximum and expected annual volumes and the activity becquerel (curie) and radionuclide content of wastes to be shipped ~~offsite~~ off site for each waste category.

C.I.11.4.2.4 *Effluent Controls*

Provide system P&IDs and process flow diagrams showing methods of operation and factors that influence waste treatment (e.g., system interfaces and potential bypass routes). For each subsystem, tabulate or show on the flow diagrams the normal process route, maximum and expected flow rates (m^3/~~day~~ or ~~gallons/day~~ g/d), equipment holdup times, expected radionuclide content of each flow for normal operation, including ~~anticipated operational occurrences~~ AOOs, and equipment capacities. Provide information on instrumentation used to monitor the performance of systems and control releases of radioactivity, including sensor and readout locations, operation ranges, alarm and controlling functions, and bases for alarm setpoints. Provide the bases for the values used, including all supporting references.

Provide P&IDs ~~which~~ that indicate system interconnections and seismic and quality group interfaces. Describe any instrumentation and controls that govern operation. Indicate all potential bypasses of normal process routes, the conditions governing their use, and the anticipated frequency of bypass due to equipment downtime. Describe both the normal operation of each system and the differences in system operation during ~~anticipated operational occurrences~~ AOOs.

In addition, provide P&IDs and process flow diagrams showing the methods of operation, expected chemical content, and radionuclide concentrations of liquid wastes to be processed and handled by the ~~solid waste management system~~ SWMS. Also, indicate the expected volumes to be returned to the liquid radwaste system for further treatment.

C.I.11.4.2.5 *Operation and Personnel Exposure*

Describe design provisions incorporated in the equipment and facility design to reduce occupational radiation exposures, leakages, and spills, and to facilitate operation and maintenance. Describe waste processing equipment expected to exhibit elevated levels of external radiation, the placement of such equipment in shielded cubicles, and the use of temporary or permanent shielding mounted on or in the immediate vicinity of the equipment. Describe methods used to control and minimize the spread of radioactive contamination during sample collection and preparation for analysis. Describe how the ALARA provisions of Regulatory Guides 8.8 "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable," and 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable," will be implemented in system designs and operation to ensure compliance with occupational dose limits of 10 CFR ~~§§~~ 20.1201 and 10 CFR 20.1202 and occupational limits of ~~10 CFR Part 20, Appendix B,~~ Table 1 ~~f~~ (annual limit on intake (ALI) and derived air concentration (DAC)) of Appendix B to 10 CFR Part 20

In accordance with the requirements of 10 CFR 20.1406, describe how the above design features and operational procedures will minimize, to the extent practicable, contamination of the facility and the environment, facilitate decommissioning, and minimize, to the extent practicable, the generation of radioactive waste.

C.I.11.4.3 Radioactive Effluent Releases

Calculate releases by radionuclide for the total system and for each subsystem. Demonstrate compliance with regulations by comparing the calculated releases with the concentration limits in Table 2 of Appendix B to 10 CFR Part 20~~, Appendix B, Table 2~~.

Describe the process used to demonstrate compliance with GDC 13, "Instrumentation and Control," 60, 63, "Monitoring Fuel and Waste Storage," and 64~~ of 10 CFR Part 50, Appendix A~~, as they relate to monitoring and controlling radioactive releases during routine operations and accident conditions.

~~Describe how the process control program (PCP) and operational procedures will ensure~~Provide the PCP to demonstrate compliance with the provisions of ~~Parts~~10 CFR 61.55 and ~~61~~10 CFR 61.56 on low-level radioactive waste classifications and characteristics, waste transfers and shipping manifest requirements of Appendix G to ~~Part 20~~10 CFR Part 20, and NRC and DOT shipping regulations (10 CFR Part 71~~;~~ and 49 CFR Parts 171 ~~–~~ 180), and waste acceptance criteria of authorized ~~waste~~ disposal facilities. ~~Provide a copy of the process control program (PCP).~~

~~Compare the~~ Describe how the guidance of NUREG-1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," or NUREG-1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Control for Boiling Water Reactors," and NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," were used in developing the PCP.

Compare doses due to the releases with the numerical design objectives of Appendix I to 10 CFR Part 50 ~~(§50.34a) and the dose limits~~ compliance requirements of 10 CFR 20.1302, and the EPA's environmental radiation standards of 40 CFR Part 190 as they apply in SRP Section 11.5 in determining total dose. Indicate how the above regulations will be met during both normal operations and ~~anticipated operational occurrences~~AOOs of the waste management system.

Identify all release points of radioactive material from the ~~solid waste management system~~ SWMS to the environment and locations of process and effluent radiation monitoring systems on process flow diagrams, general arrangement drawings, or site plot plan. For effluent release points and disposal methods, provide the following information:

(1) ~~L~~location of processing or release points~~;~~
(2) ~~M~~material types (e.g., solid, liquid, gaseous, components~~, etc.~~)
(3) ~~M~~material characteristics (e.g., chemical, radiological, and physical for plant effluents~~;~~)
(4) ~~M~~material properties (e.g., 10 CFR Part 61 classification and characteristics for waste disposal~~;~~)
(5) ~~S~~size, shape, and number of material containers and number of expected shipments~~; and~~
(6) ~~F~~final disposition or disposal method (e.g., burial, recycling~~, etc.~~)~~.~~

C.I.11.5 ***Process and Effluent Radiological Monitoring and Sampling Systems***

In this section, describe the systems that monitor and sample the process and effluent streams in order to control releases of radioactive materials generated as the result of normal operations, including ~~anticipated operational occurrences~~AOOs, and during postulated accidents.

TSection 9.3.2 of the FSAR should describe the process sampling systemshould be described in Section 9.3.2 of the FSAR and summarized here, including flow diagrams and essential design features which should be referenced in this section. Include essential descriptive features of the design and flow diagrams, as they apply to this SRP section

C.I.11.5.1 Design Bases

Describe the design objectives and design criteria for the process and effluent radiological monitoring instrumentation systems and sampling systems in accordance with the requirements of 10 CFR Parts 20 and 10 CFR Part 50. Indicate whether, and if so how, the guidance of Regulatory Guides 1.21, "Measuring and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants,"1.33, and 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operation)—Effluent Streams and the Environment," will be followed. If it will not be followed, describe the specific alternative methods to be used. For the effluent monitoring system, distinguish between the design objectives for normal operations, including anticipated operational occurrencesAOOs, and the design objectives for monitoring postulated accidents.

Describe both the site-specific and program aspects of the process and effluent monitoring and sampling in accordance with ANSI N13.1-1999"Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities," and ANSI N42.18-1980,"Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents,"Regulatory Guides 1.21, 1.97,"Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," and 4.15, and Appendix 11.5-AA, "Design Guidance for Radiological Effluent Monitors,"to SRP Section 11.5. If this guidance will not be followed, describe the specific alternative methods to be used.

C.I.11.5.2 System Description

Provide system descriptions for process and effluent radiological detectors and samplers used to monitor and control releases of radioactive materials generated as the result of normal operations, including anticipated operational occurrencesAOOs, and during postulated accidents.

Identify the process and effluent streams to be monitored by radiation detection instrumentation or sampled for separate analyses, the purpose of each instrumented monitoring or sampling function provided, and the parameters to be determined through monitoring instrumentation or sampling and analysis (e.g., gross beta-gamma concentrations, radionuclide distribution, quantities of specific radionuclides).

For continuous process and effluent radiation monitors, provide the following information:

(1) Llocation of monitors and direct readouts;

(2) Llocation of sampling points and sampling stations, using the criteria of Tables 1 and 2 of SRP Section 11.5;

(3) Ttype of monitor, sensitivity, and measurement, analysisor determination to be made (e.g., gross beta-gamma concentration, radionuclide analysis);

(4) Ddescription of instrumentation, related instrumentation, and sampling equipment, including redundancy, independence, calibration, and diversity of the components supplied;

(5) Ccalculation of the range of radioactivity concentrations to be monitored or sampled for normal operations, anticipated operational occurrencesAOOs, and postulated accidents and bases in

accordance with the requirements of GDC 13 and 64 of Appendix A of 10 CFR Part 50 and 10 CFR Parts CFR 50.34(f)(2)(xvii) and 10 CFR 50.34(f)(2)(xxvii);

(6) Ttypes and locations of annunciators, alarms, and automatic controls and actions initiated by each, including provisions for the termination of flow and releases;

(7) Pprovisions for emergency power supplies;

(8) Ssetpoints for trips/alarms and controls and bases for values chosen, including a discussion of how setpoints will be established for effluent streams containing multiple radionuclides;

(9) Ddescription of provisions for radiological monitoring instrument calibration, maintenance, inspection, decontamination, and replacement;

(10) Ddescription of provisions for purging sample lines, waste tank recirculation rates, input volumes to waste collection systems, representative sampling, and sampling frequency;

(11) Eexpected relationships between monitoring instrumentation readouts, sampling analytical results, and plant operations;

(12) Llayout drawings, P&IDs, and process flow diagrams; and,

(13) Mmonitoring systems and procedures for detection of radioactivity in nonradioactive systems to prevent unmonitored and uncontrolled releases of radioactive material to the environment.

For each location subject to routine sampling, indicate whether, and if so how, the guidance of Regulatory Guide 1.21 and Appendix 11.5-A Appendix A to SRP Section 11.5 will be followed. If it will not be followed, describe the specific alternative methods to be used. Provide the following information for each location:

(1) Bbasis for selecting the location;

(2) Eexpected flow, composition, and concentrations;

(3) Qquantity to be measured (e.g., gross, beta-gamma, radionuclide concentrations);

(4) Ssampling frequency, type of sample nozzle or other sample equipment designed in accordance with ANSI N13.1-1999, and procedures used to obtain representative samples; and,

(5) Aanalytical procedure and sensitivity for selected radioanalytical methods and types of sampling media.

Provide an offsite dose calculation manual (ODCM) containing a description of the methodology and parameters used for calculation of offsite doses resulting from gaseous and liquid effluents and planned discharge flow rates, using the guidance of NUREG-1301 (PWRs) or NUREG-1302 (BWRs) and NUREG-0133. Address the 10 CFR Part 50, Appendix I, guidelines for maximally exposed offsite individual doses and population doses via liquid and gaseous effluents. Indicate how the guidance of Regulatory Guides 1.109 and 1.111 or 1.113 will be followed. If this guidance will not be followed, describe the specific alternative methods to be used.

Provide the plant's standard radiological effluent controls (SREC) describing how liquid and effluent release rates will be derived and parameters used in setting instrumentation alarm setpoints to control or terminate effluent releases in unrestricted areas that are above 10 CFR Part 20, Appendix B the effluent concentrations (in Table 2) in unrestricted areas of Appendix B to 10 CFR Part 20. Describe how the guidance of NUREG-1301 (PWRS) or NUREG-1302 (BWRs) and NUREG-0133 were used in developing the bases of alarm setpoints.

Provide the radiological environmental monitoring program (REMP) describing the scope of the program taking into account local land use census data in identifying all potential radiation exposure pathways, associated radioactive materials present in liquid and gaseous effluent, and direct external radiation from structures, systems, and components. Describe how the guidance of NUREG-1301~~(PWRs)~~ or NUREG-1302~~(BWRs)~~ and NUREG-0133 were used in developing the REMP.

Describe the process used to demonstrate compliance with GDC 13, 60, 61, 63, and 6~~4 of 10 CFR Part 50, Appendix A~~, as they relate to monitoring and controlling radioactive releases during routine and accident conditions. Also describe the process used to demonstrate compliance with the requirements of 10 CFR ~~Parts~~ 50.34(f)(2)(xvii) and 10 CFR 50.34(f)(2)(xxvii).

Describe the process used to demonstrate compliance with Appendix ~~I~~ to 10 CFR Part 50, as it relates to ALARA numerical design objectives and the requirements of 10 CFR ~~Parts 50.34a and 50.36a.~~50.34a and 10 CFR 50.36a, "Technical Specifications on Effluents from Nuclear Power Reactors."

Describe the process used to demonstrate compliance with 10 CFR 20.1302 ~~dose limits and~~ requirements; 10 CFR Part 20, Appendix B, effluent concentrations (Table 2) to members of the public in unrestricted areas~~;~~, and EPA environmental radiation standards of 40 CFR Part 190 as they apply in determining total dose from effluents described in SRP Sections 11.2, 11.3, and 11.4~~.~~

C.I.11.5.3 Effluent Monitoring and Sampling

Indicate how the requirements of GDC 64 ~~of 10 CFR Part 50, Appendix A,~~ will be implemented with respect to effluent discharge paths for radioactivity that may be released from normal operations, including ~~anticipated operational occurrences~~AOOs, and during postulated accidents.

Describe situations when sampling equipment is expected to exhibit elevated levels of external radiation, the placement of such equipment in shielded cubicles, and the use of temporary or permanent shielding mounted on or in the immediate vicinity of sampling equipment. Describe methods used to control and minimize the spread of radioactive contamination during sample collection and preparation for analysis. Describe how system designs and operation will implement the ALARA provisions of Regulatory Guides 8.8 and 8.10 ~~will be implemented in system designs and operation~~ to ensure compliance with the occupational dose limits of 10 ~~CFR Parts~~ CFR 20.1201 and ~~20~~10 CFR 20.1202 and ~~10 CFR Part 20, Appendix B, Table 1~~ the occupational limits (ALI and DAC) in Table 1 of Appendix B to 10 CFR Part 20

C.I.11.5.4 Process Monitoring and Sampling

Indicate how the requirements of GDC 60 ~~of Appendix A to 10 CFR Part 50~~ will be implemented with respect to the automatic closure of isolation valves in gaseous and liquid effluent discharge paths. Indicate how the requirements of GDC 63 ~~of Appendix A to 10 CFR Part 50~~ will be implemented with respect to the monitoring of radiation levels in radioactive waste process systems.

C.I.11.6 *References*

Regulatory Guide 1.11, "Instrument Lines Penetrating Primary Reactor Containment."

Regulatory Guide 1.21, ~~"Measuring~~ "Measuring and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants."

Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operations)."

Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident."

Regulatory Guide 1.109, ~~"Calculation~~"Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I.~~"~~"

Regulatory Guide 1.110, ~~"Cost-Benefit~~"Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors.~~"~~"

Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors."

Regulatory Guide 1.112, ~~"Calculation~~"Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluent from Light-Water-Cooled Power Reactors.~~"~~"

Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I."

Regulatory Guide 1.140, ~~"Design~~"Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants.~~"~~"

Regulatory Guide 1.143, ~~"Design~~"Design Guidance for Radioactive Waste Management Systems, Structures and Components in Light-Water-Cooled Nuclear Reactor Power Plants.~~"~~"

Regulatory Guide 4.15, "Quality Assurance for Radiological Monitoring Programs (Normal Operation) ~~- Effluent~~—Effluent Streams and the Environment."

Regulatory Guide 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as Is Reasonably Achievable."

Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable."

10 CFR Part 20, ~~"Standards~~"Standards for Protection Against Radiation.~~"~~"

10 CFR Part 50, ~~"Domestic~~"Domestic Licensing of Production and Utilization Facilities~~"~~."

10 CFR Part 61, ~~"Licensed~~"Licensed Requirements for Land Disposal of Radioactive Waste.~~"~~"

10 CFR Part 71, "Packaging and Transportation of Radioactive Material."

10 CFR Part 100, "Reactor Site Criteria."

40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

49 CFR Part 173, "Shippers—General Requirements for Shipments and Packagings, Subpart I—Class 7 Radioactive Materials."

General Design Criteria 13, "Instrumentation and Control," as specified in Appendix A to 10 CFR Part 50, available electronically through the NRC's public Web site, at www.nrc.gov.

General Design Criteria 60, "Control of Releases of Radioactive Materials to the Environment," as specified in Appendix A to 10 CFR Part 50, available electronically through the NRC's public Web site, at ~~www~~http://www.nrc.gov.

General Design Criteria 61, "Fuel Storage and Handling and Radioactivity Control," as specified in Appendix A to 10 CFR Part 50, available electronically through the NRC's public Web site~~-~~, at ~~www~~http://www.nrc.gov.

General Design Criteria 63, "Monitoring Fuel and Waste Storage," as specified in Appendix A to 10 CFR Part 50, available electronically through the NRC's public Web site, at http://www.nrc.gov.

General Design Criteria 64, "Monitoring Radioactivity Releases," as specified in Appendix A to 10 CFR Part 50, available electronically through the NRC's public Web site, at ~~www~~http://www.nrc.gov.

~~General Design Criteria 64, "Monitoring Radioactivity Releases," as specified in Appendix A to 10 CFR Part 50, available electronically through the NRC's public Web site, at www.nrc.gov.~~

Generic Letter 80-0~~0~~9, "Low Level Radioactive Waste Disposal."

Generic Letter 81-038, "Storage of Low Level Radioactive Waste at Power Reactor Sites."

Generic Letter 81-039, "NRC Volume Reduction Policy."

Information Bulletin ~~No.~~ 80-10, "Contamination of Non~~-R~~radioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity in the Environment."

NUREG-0016, ~~"Calculation~~"Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Boiling Water Reactors (BWRs)~~," Revision 1.~~"

NUREG-0017, ~~"Calculation~~"Calculation of Releases of Radioactive Materials in Gaseous and Liquid Effluents from Pressurized Water Reactors (PWRs)~~," Revision 1.~~"

NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants."

NUREG-1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors."

NUREG-1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors."

NUREG/CR-4013, "LADTAP II ~~-~~ —Technical Reference and User Guide."

NUREG/CR-4653, "GASPAR ~~II - Technical~~II—Technical Reference and User Guide."

~~Branch Technical Position (BTP) ETSB 11-5, "Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure" (attached to SRP Section 11.3).~~

Branch Technical Position ~~(BTP) ETSB~~ 11-3, ~~"Design~~"Design Guidance for Solid Radioactive Waste Management Systems Installed in Light-Water-Cooled Nuclear Power Reactor Plants~~"~~" (attached to ~~SRP~~Standard Review Plan Section 11.4).

Branch Technical Position 11-5, "Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure" (attached to Standard Review Plant Section 11.3).

Standard Review Plan Section 11.4, Appendix A, "Radiological Safety Guidance for Onsite Contingency Storage Capacity."

Standard Review Plan Section 11.5, Appendix A, "Design Guidance for Radiological Effluent Monitors."

ANSI N13.1-1999, ~~"Guide~~"Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities.~~"~~"

ANSI/ANS 18.1-1999, "Radioactive Source Term for Normal Operation of Light-Water ~~Reactors."~~ Reactors."

ANSI/ANS 40.37-200x (draft), "Mobile Low-Level Radioactive Waste Processing Systems." Note: At the time of this printing the American National Standards Institute is about to release this standard for public comments. Final version of this standard is expected to be issued in late 2007.

ANSI N42.18-1980, ~~"Specification~~"Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents.~~"~~" (Formerly designated as ANSI N13.10-1980.)

SECY-93-323, "Withdrawal of Proposed Rulemaking to Establish Procedures and Criteria for On-Site Storage of Low-Level Radioactive Waste after January 1, 1996." Issued under the staff requirements memorandum dated February 1, 1994.