

9.0 AUXILIARY SYSTEMS

9.1 Fuel Storage and Handling

9.1.1 New Fuel Storage

As documented in NUREG-1966, “Final Safety Evaluation Report related to the Certification of the Economic Simplified Boiling-Water Reactor (ESBWR) Standard Design,” (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML14100A304), and NUREG-1966, Supplement 1 (ADAMS No. ML14265A084), the U.S. Nuclear Regulatory Commission (NRC) staff reviewed and approved Subsection 9.1.1 of the ESBWR Design Control Document (DCD). The staff reviewed Subsection 9.1.1 “New Fuel Storage” of the Fermi 3 Combined License (COL) Final Safety Analysis Report (FSAR), Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the DCD represents the complete scope of information relating to this review topic.¹

Subsection 9.1.1.7 of the ESBWR DCD, indicates that the applicant is to address DCD COL Item 9.1-4-A. The COL applicant has removed the two references to COL 9.1-4-A in DCD Subsection 9.1.1.7 and has addressed them as STD COL 9.1-4-A in Subsection 9.1.4. The staff’s review of this STD COL item is discussed in Subsection 9.1.4 of this safety evaluation report (SER). The staff’s review confirms that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 52.63(a)(5) and 10 CFR Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” Appendix E, Section VI.B.1, all nuclear safety issues relating to new fuel storage that were incorporated by reference are resolved.

9.1.2 Spent Fuel Storage

Subsection 9.1.2 of the Fermi 3 COL FSAR incorporates by reference Section 9.1.2, “Spent Fuel Storage,” of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff’s review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the spent fuel storage that were incorporated by reference are resolved.

9.1.3 Spent Fuel Cooling and Cleanup System

Section 9.1.3 of the Fermi 3 COL FSAR incorporates by reference Section 9.1.3, “Spent Fuel Cooling and Cleanup System,” of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements,. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff’s review confirms that there is no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR

¹ See “Finality of Referenced NRC Approvals” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the spent fuel cooling and cleanup system that were incorporated by reference are resolved.

9.1.4 Light Load Handling System (Related to Refueling)

9.1.4.1 Introduction

This FSAR section addresses the light load handling system that is used to handle the spent fuel assemblies underwater from the time they leave the reactor vessel until they are placed in a container for shipment from the site. Characteristics of the system are designed to avoid criticality accidents, radioactivity releases resulting from damage to irradiated fuel, and unacceptable personnel radiation exposure.

9.1.4.2 Summary of Application

Subsection 9.1.4 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Subsection 9.1.4 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Subsection 9.1.4, the applicant provides the following:

COL Item

- STD COL 9.1-4-A Fuel Handling Operations

The applicant provided additional information in STD COL 9.1-4-A to address DCD COL Item 9.1-4-A. The applicant described the scope of the fuel handling procedures and procedures for equipment used to move the fuel. The applicant states that these procedures will be developed 6 months before fuel receipt. The applicant states that the fuel handling equipment is inspected for operating conditions before each refueling and that a quality assurance (QA) program is applied to monitoring, implementing, and assuring compliance with fuel handling procedures. The QA program is described in Section 17.5 of the COL FSAR.

9.1.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966, the Final Safety Evaluation Report (FSER) related to the certified ESBWR DCD. In addition, the relevant requirements of the Commission regulations for the light load handling system (related to refueling) and the associated acceptance criteria are in Section 9.1.4 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," the Standard Review Plan (SRP).

The applicable regulatory requirements and associated guidance for fuel handling operations are as follows:

- General Design Criterion (GDC) 61, “Fuel storage and handling and radioactivity control,” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities” as it relates to radioactive releases resulting from fuel damage and the avoidance of excessive personnel radiation exposure.
- GDC 62, “Prevention of criticality in fuel storage and handling,” as it relates to prevention of criticality accidents
- Regulatory Guide (RG) 1.206, “Combined License Applications for Nuclear Power Plants (LWR Edition),” June 2007, as relates to the applicant’s cited commitment (COM) in this subsection

9.1.4.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.1.4 of the certified ESBWR DCD. The staff reviewed Subsection 9.1.4 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD the represents the complete scope of information relating to this review topic.¹ The staff’s review confirms that the information in the application and the information incorporated by reference address the required information related to the Light Load Handling System (Related to Refueling).

The staff’s review of the information contained in the Fermi 3 COL FSAR is as follows:

COL Item

- STD COL 9.1-4-A Fuel Handling Operations

The NRC staff reviewed STD COL 9.1-4-A related to the fuel handling operations included under Section 9.1.4 of the Fermi 3 COL FSAR. DCD COL Item 9.1-4-A in Section 9.1.6, “COL Information,” of the ESBWR DCD, Revision 10, states that the applicant will provide a description of programs that address the following:

- Criticality safety of fuel handling operations
- Fuel handling procedures
- Maintenance manuals and procedures for equipment used to move fuel
- Equipment inspection and test plans for equipment used to move fuel
- Personnel qualifications, training, and control programs for fuel handling personnel
- [Quality Assurance] QA programs to monitor, implement, and assure compliance to fuel handling operations

¹ See “Finality of Referenced NRC Approvals” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

In FSAR Subsections 9.1.4.13, "Refueling Operations," 9.1.4.18, "Safety Evaluation of Fuel Handling Systems," and 9.1.4.19, "Inspection and Testing Requirements," the applicant addressed DCD COL Item 9.1-4-A in STD COL 9.1-4-A. The applicant added a paragraph to the end of FSAR Subsection 9.1.4.13 indicating that FSAR Section 13.5 requires the development of fuel handling procedures. The applicant stated that the procedures will provide "instruction for use of refueling equipment, actions for core alteration, monitoring core criticality status, and accountability of fuel and refueling operations. The applicant also identified key elements to be included in the fuel handling procedures that will be developed. The applicant stated that fuel handling procedures will address, "the status of plant system required for refueling; inspection of replacement fuel and fuel rods; designation of proper tools; proper conditions for spent fuel movement and storage; proper conditions to prevent inadvertent criticality; proper conditions for fuel cask loading and movement; and status of interlocks, reactor trip circuits and mode switches. In FSAR Subsection 9.1.4.13, the applicant also stated that qualifications and training for fuel handlers are addressed in FSAR Section 13.2, "Training."

In FSAR Subsection 9.1.4.18, the applicant indicates that fuel handling procedures provided to prevent inadvertent criticality was discussed in Subsection 9.1.4.13 of the FSAR. Also in response to DCD COL Item 9.1-4-A, the applicant revised Subsection 9.1.4.19 of the FSAR to identify that the QA program described in FSAR Section 17.5, "Quality Assurance Program Description-Design Certification, Early Site Permits, and New License Applicants," will monitor, implement and assure compliance with fuel handling procedures.

The program described by the applicant in FSAR Subsections 9.1.4.13, 9.1.4.18, and 9.1.4.19 provide procedures for fuel handling and for inspection and testing of fuel handling equipment in adequate time to support training and qualification of fuel handling personnel. These procedures will be completed 6 months prior to fuel load (COM 9.1-001). Qualifications, training, and control programs for fuel handling personnel are addressed in FSAR Section 13.2, "Training," which refers to Appendix 13BB, "Training Program," which incorporates by reference Nuclear Energy Institute (NEI) 06-13A, "Template for an Industry Training Program Description." On December 5, 2008, the NRC endorsed NEI 06-13A, "Template for an Industry Training Program Description," Revision 1, as an acceptable template for describing reactor operator (RO) and non-licensed plant staff training programs for COL applications (ADAMS Accession No. ML082950140). The staff finds that the applicant has adequately addressed the development of fuel handling procedures and the training and qualification of fuel handlers. In addition the staff finds that the fuel handling procedures will conform with the requirements of GDC 61 and 62 as they relate to the prevention of radioactivity release as a result of fuel damage, avoidance of excessive personnel radiation exposure, and prevention of criticality accidents.

The applicant has identified Commitment COM 9.1-001 to track the development of fuel handling procedures in order to address COL STD COL 9.1-4-A in accordance with the guidance in RG 1.206, Regulatory Position Part C.III.4.3(4). The staff evaluated COL Item STD COL 9.1-4-A using the relevant NRC regulations and acceptance criteria in Section 9.1.4 of NUREG-0800, along with GDC 61 and 62 and the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed this COL Item.

9.1.4.5 Post Combined License Activities

The applicant has proposed the following commitment to address COL Item 9.1-4-A:

- Commitment (COM 9.1-001) – Fuel handling procedures are developed six months before fuel receipt to allow sufficient time for plant staff familiarization, to allow NRC staff adequate time to review procedures, and to develop operator licensing examinations.

9.1.4.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the light load handling system (related to refueling), and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the light load handling system (related to refueling) that were incorporated by reference are resolved.

In addition, the staff compared the additional information in the application to the relevant NRC regulations, the guidance in Section 9.1.4 of NUREG–0800, and other NRC regulatory guides. The staff's review concludes that the applicant's information is acceptable and meets the requirements of GDC 61 and 62 and the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.1-4-A.

9.1.5 Overhead Heavy Load Handling System

9.1.5.1 Introduction

This FSAR section addresses the overhead heavy load handling systems that are used to lift loads whose weight is greater than the combined weight of a single spent fuel assembly and its handling device. The principal equipment is the fuel building (FB) crane and reactor building (RB) crane. The overhead heavy load handling system is designed to ensure that inadvertent operations or equipment malfunctions, separately or in combination, will not cause a release of radioactivity, a criticality accident, or an inability to cool fuel within the reactor vessel or spent fuel pool (SFP), and will not prevent safe shutdown of the reactor.

9.1.5.2 Summary of Application

Subsection 9.1.5 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Subsection 9.1.5 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Subsection 9.1.5, the applicant provides the following:

COL Items

- STD COL 9.1-5-A Handling of Heavy Loads

The applicant provided additional information in STD COL 9.1-5-A to address DCD COL Item 9.1-5-A. The applicant described the scope of the heavy load handling procedures. The applicant stated that they will be developed prior to fuel load. The applicant stated that the fuel handling equipment is inspected for operating conditions before each refueling. The applicant

described the criteria for inspection of special lifting devices and the inspection and testing of cranes. The applicant described the training and qualification standard for crane operators and the application of specific QA program controls for heavy load handling. The QA program is described in Section 17.5 of the COL FSAR.

9.1.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the overhead heavy load handling system and the associated acceptance criteria are in Section 9.1.5 of NUREG-0800.

The regulatory basis for acceptance of the COL information items is established in:

- GDC 1, “Quality Standards and Records,” of 10 CFR Part 50, as it relates to design, fabrication, and testing of structures systems and components (SSCs) important to maintain quality standards
- GDC 4, “Environmental and dynamic effects design bases” of 10 CFR Part 50, as it relates to the protection of fuel and safety-related equipment from the effects of internally generated missiles (i.e. dropped loads).

9.1.5.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Subsection 9.1.5 of the certified ESBWR DCD. The staff reviewed Subsection 9.1.5 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff’s review confirms that the information in the application and information incorporated by reference address the required information related to this section.

The staff reviewed the information in the Fermi 3 COL FSAR as follows:

- STD COL 9.1-5-A Handling of Heavy Loads

The NRC staff reviewed COL Item STD COL 9.1-5-A related to the handling of heavy loads under Section 9.1.5 of the Fermi 3 COL FSAR. DCD COL Item 9.1-5-A in Section 9.1.6, “COL Information,” of the ESBWR DCD Tier 2, Revision 10, states that the applicant will provide a description of programs governing heavy load handling, and the schedule for implementation, that address the following:

- Heavy loads and heavy load handling equipment outside the scope of loads described in the referenced certified design and the associated heavy load attributes (load weight and typical load path)
- Requirements for heavy load handling safe load paths and routing plans including descriptions of automatic and manual interlocks not described in the referenced

¹ See “Finality of Referenced NRC Approvals” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

certified design and safety devices and procedures to assure safe load path compliance

- Summary description of requirements to develop heavy load handling equipment maintenance manuals and procedures
- Requirements for heavy load handling equipment inspection and test plans
- Requirements for heavy load personnel qualifications, training, and control programs
- QA program requirements to monitor, implement, and ensure compliance with the heavy load handling program
- Issues described in Regulatory Issue Summary (RIS) 2005-25, Supplement 1, "Clarification of NRC Guidelines for Control of Heavy Loads," related to the use of non-metallic slings with single failure proof lifting devices.

In FSAR Subsections 9.1.5.6, "Other Overhead Load Handling Systems," 9.1.5.8, "Operational Responsibilities", and 9.1.5.9, "Safety Evaluations," the applicant addressed ESBWR DCD COL Item 9.1-5-A in STD COL 9.1-5-A.

The first item listed in COL Item STD COL 9.1-5-A pertaining to heavy loads and heavy load handling equipment outside the scope of loads described in the certified design is addressed in FSAR Subsection 9.1.5.9. In that subsection the applicant states that no heavy loads are identified that are outside the scope of the certified design. The applicant also states that there is no load handling equipment, nor interlocks associated with heavy load handling equipment outside the scope of the certified design. Based on the information provided by the applicant in FSAR Subsection 9.1.5.9, the staff finds that the applicant has satisfied this element of the COL information item requirement.

The second item listed in COL Item STD COL 9.1.5-A pertains to requirements for heavy load handling safe load paths and routing plans. In FSAR Section 9.1.5.8, the applicant discusses procedures. In that section, the applicant specifies that FSAR Subsection 13.5 requires the development of administrative procedures to control heavy loads prior to fuel load. The subsection also specifies that heavy load handling procedures address approved safe load paths and exclusion areas. The applicant states that paths are defined in procedures and equipment layout drawings, and that safe load path procedures address specific requirements. There are procedures to limit the height and the times that heavy loads are carried over the SFP, reactor vessel, or the safe shutdown equipment. In addition, when heavy loads could be carried but are not required to be carried directly over the SFP, reactor vessel, or the safe shutdown equipment, procedures will define an area over which loads shall not be carried so that if the load is dropped, it will not result in damage to spent fuel or operable safe shutdown equipment or compromise reactor vessel integrity. A requirement for supervision to be present during heavy load lifts to enforce procedural requirements is also discussed in FSAR Subsection 9.1.5.8. Based on the information that was provided by the applicant in FSAR Sections 13.5, and Subsection 9.1.5.8, the staff finds that the applicant has satisfied this element of the COL information item requirement since it specifies that the heavy load handling program will include program elements for safe paths, routing plans, and administrative controls.

The third item listed in COL Item STD COL 9.1.5-A pertains to the applicant providing a description of requirements to develop heavy load handling equipment maintenance manuals and procedures, and the fourth item listed in STD COL 9.1.5-A is concerned with the requirements for heavy load handling equipment inspection and test plans. In FSAR Subsection 9.1.5.8, a list of items to be addressed by the heavy loads handling procedures is provided. Among those are procedures to address equipment identification, required equipment inspections and acceptance criteria prior to performing lift and movement operations, safety precautions and limitations, rigging arrangement for loads, and special tools, rigging hardware, and equipment required for the heavy load lifts.

Inspection and test plans for heavy load handling equipment is addressed by the addition of two new paragraphs in Subsection 9.1.5.6 titled, "Special Lifting Devices" and "Other Lifting Devices" and one new paragraph in Subsection 9.1.5.8 titled, "Inspection and Testing." The "Special Lifting Devices" paragraph states that testing and inspection of special lifting devices will follow the guidelines of American National Standards Institute (ANSI) N14.6, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds (4500 kg) or More." The "Other Lifting Devices" paragraph states that "slings used for heavy load lifts meet the requirements specified for slings in ANSI B30.9 and the guidance specified in NUREG-0612, Section 5.1.1(5)." Additionally, to address COL Item STD COL Item 9.1-5-A, the applicant replaced the information in ESBWR DCD, Subsection 9.1.5.8 with a revised FSAR Subsection 9.1.5.8, "Operational Responsibilities," that includes a new "Inspection and Testing" paragraph. In this paragraph, the applicant references ANSI B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)," B30.11, "Monorails and Underhung Cranes," and B30.16, "Performance Standards for Air Wire Rope Hoists" as the applicable standards for crane testing and inspection.

Based on the information that the applicant has added to FSAR Subsections 9.1.5.6, and 9.1.5.8, the staff finds that the applicant has satisfied these elements of the COL information item requirement.

The fifth item listed in STD COL 9.1.5-A pertains to the requirement for heavy load personnel qualifications, training, and control programs. The applicant stated in Section 9.1.5.6 that the operators will be trained and qualified to meet the requirements of ANSI B30.2. Based on this information, the staff finds that the applicant has satisfied these elements of the COL information item requirement.

The sixth item listed in COL Item STD COL 9.1.5-A pertains to QA program requirements to monitor, implement, and ensure compliance with the heavy load handling program. In Subsection 9.1.5.8 of the FSAR, the applicant states that the QA program described in Section 17.5, "Quality Assurances Program Description-Design Certification, Early Sight Permits, and New License Applicants," is applicable to the heavy loads handling program. Based on this information, the staff finds that the applicant has satisfied these elements of the COL information item requirement.

The seventh, and last issue, listed in COL Item STD COL 9.1.5-A pertains to issues described in Regulatory Issue Summary (RIS) 2005-25, Supplement 1. In FSAR Subsections 9.1.5.8, the applicant addresses how the procedures address issues described in RIS 2005-25, related to the use of non-metallic slings with single failure proof cranes. The Subsection states that heavy load handling procedures will address, "The use of slings constructed from metallic material where the single-failure-proof features of the handling system are credited in achieving a very low probability of a load drop as described in Regulatory Information Summary (RIS) 2005-25,

Supplement 1, and Clarification of NRC Guidelines for Control of Heavy Loads.” Based on this information, the staff finds that the applicant has satisfied these elements of the COL information item requirement.

The staff evaluated COL Item STD COL 9.1-5-A using the relevant NRC regulations and acceptance criteria in Section 9.1.5 of NUREG-0800. Based on the above evaluation, the staff finds that the applicant has satisfactorily addressed DCD COL Item 9.1-5-A. The staff also finds that since there will be a QA program with requirements to monitor, implement, and ensure compliance with the heavy load handling program including the program requirements for inspection and testing of equipment, and the program requirements regarding the qualification, and training of personnel, that GDC 1 requirements related to design, fabrication, and testing of SSCs important to maintain quality standards are satisfied. Furthermore, the staff finds that since the heavy load handling program will implement procedures that will provide for the protection of fuel and safety-related equipment from the effects of internally generated missiles that could be generated in the event of a heavy load drop, the requirements of GDC 4 are satisfied.

9.1.5.5 *Post Combined License Activities*

There are no post COL activities related to this section.

9.1.5.6 *Conclusion*

The NRC staff’s finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirms that the applicant has addressed the required information relating to the overhead heavy load handling system and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the overhead heavy load handling system that were incorporated by reference are resolved.

In addition, the staff compared the additional COL information in the application to the relevant NRC regulations, the guidance in Section 9.1.5 of NUREG–0800, and other NRC regulatory guides. The staff’s review concludes that the information in this FSAR is acceptable because it meets the requirements of GDC 1 and GDC 4 and satisfactorily addresses DCD COL Item 9.1-5-A.

9.2 *Water Systems*

9.2.1 *Plant Service Water System*

9.2.1.1 *Introduction*

This FSAR section describes the plant service water system (PSWS). This system is designed to transfer heat from nonsafety-related components in the reactor and turbine buildings to the environment. The PSWS consists of two independent and fully redundant trains that continuously recirculate raw water through the reactor component cooling water system (RCCWS) and turbine component cooling water system (TCCWS) heat exchangers. The source of cooling water for the PSWS is from either the normal power heat sink (NPHS) or the auxiliary heat sink (AHS) depending on plant conditions. A natural draft cooling tower is utilized

for the NPHS and mechanical draft cooling towers are utilized for the AHS with heat rejection to the environment.

9.2.1.2 Summary of Application

Subsection 9.2.1 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Subsection 9.2.1 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Subsection 9.2.1, the applicant provides the following:

COL Item

- EF3 COL 9.2.1-1-A Material Selection

In FSAR Subsection 9.2.1.2, the applicant provided additional information in EF3 COL 9.2.1-1-A to address DCD COL Item 9.2.1-1-A. The applicant selected carbon steel pipe for both the above-grade and below-grade service water system. The applicant also stated that a corrosion protection system consistent with the guidance contained in American Society of Mechanical Engineers (ASME) B31.1, "Power Piping" is provided for the surfaces of buried piping systems. The buried sections of the piping are provided with waterproof protective coating and cathodic protection to control external corrosion. An appropriate chemical treatment is added to the PSWS basin to preclude the long term corrosion and fouling of the PSWS.

Supplemental Information

- EF3 SUP 9.2.1-1 Basin Reserve Storage Capacity

In FSAR Table 9.2-201, the applicant provided the following supplemental information. The PSWS cooling tower basin reserve water storage capacity is 9.08×10^3 cubic meters (m^3) (2.4 million gallons), which is needed to provide heat removal capability for 7 days without active makeup.

Site Specific Information Replacing Conceptual Design Information

- EF3 CDI System Description

The applicant provided additional information to replace the conceptual design information (CDI) contained in the ESBWR DCD. During normal power operation, the PSWS flow is directed to either the NPHS cooling tower or the AHS cooling towers where heat removed from the RCCWS and TCCWS is rejected. When the PSWS uses the NPHS, the NPHS basin provides makeup to the AHS basin. When the PSWS uses the AHS, makeup to the AHS basin is provided from the station water system (SWS). The applicant provided Figure 9.2-205, "Plant Service Water System Simplified Diagram" depicting the PSWS.

- EF3 CDI Table 9.2-201, "PSWS Component Design Characteristics"

The applicant provided additional information to replace the CDI contained in the ESBWR DCD. In FSAR Table 9.2-201, the applicant provided site specific temperature parameters and the heat load for the cooling tower design.

Interface Requirement

Section 4.1, "Plant Service Water System," of the ESBWR DCD Tier 1 information specifies as an interface requirement that the PSWS plant-specific heat rejection facilities must be capable of supporting the post-72 hour cooling function of the PSWS and must ensure that PSWS pumps have sufficient available net positive suction head (NPSH) at the pump suction. Part 10 of the COL application, Section 2.4.3, Table 2.4.3-1 "ITAAC for Plant Service Water Reserve Storage Capacity," provides the required plant-specific Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) for this interface requirement.

9.2.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the PSWS and the associated acceptance criteria are in Section 9.2.1 of NUREG-0800.

The applicable regulatory requirements for the PSWS are as follows:

- GDC 2, "Design bases for protection against natural phenomena"
- GDC 4, "Environmental and dynamic effects design bases"
- GDC 44, "Cooling water"
- GDC 45, "Inspection of cooling water system"
- GDC 46, "Testing of cooling water system"
- Item (a) of 10 CFR 52.80, "Contents of applications; additional technical information", which requires the applicant to address ITAAC

9.2.1.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.2.1 of the certified ESBWR DCD. The staff reviewed Subsection 9.2.1 of the Fermi 3 COL FSAR, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that information in the application and information incorporated by reference address the required information related to the PSWS.

The PSWS is a nonsafety-related system that provides defense-in-depth decay heat removal capability and is subject to regulatory treatment of nonsafety systems (RTNSS) based on risk considerations (i.e., RTNSS Criterion C). RTNSS Criterion C is described in SECY-94-084, "Policy, Technical, and Licensing Issues Pertaining to Evolutional and Advanced Light-Water Reactor Designs," date March 28, 1994 (ADAMS Accession No. 003708086) and in SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs (SECY-94-084)," dated May 22, 1995 (ADAMS Accession

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

No. ML003708005). The staff's evaluation of plant-specific PSWS considerations for the ESBWR design focuses primarily on confirming the capability of the PSWS to perform its defense-in-depth and RTNSS functions; confirming that the PSWS will not adversely impact safety-related SSCs; and confirming that ITAAC, test program specifications, and RTNSS availability controls for PSWS are appropriate.

The staff reviewed the relevant information in the COL FSAR as follows:

COL Information Item

EF3 COL 9.2.1-1-A

Material Selection

As discussed in Tier 2 of the DCD, Subsection 9.2.1.6, "COL Information," the COL applicant needs to determine PSWS material selection and provide provisions to preclude long-term corrosion and fouling based on site water quality analysis. In the letter dated January 29, 2010 (ADAMS Accession No. ML100331450). The applicant addressed this COL information item by using fiberglass reinforced polyester pipe (FRPP) for buried PSWS piping to preclude long-term corrosion.

The staff determined that the specifications and limitations for using FRPP should be described in the FSAR to properly document the plant design basis. In Request for Additional Information (RAI) 09.02.01-3, the staff requested the applicant to provide additional information to address these considerations and to update the FSAR accordingly.

In the letter dated July 9, 2010 (ADAMS Accession No. ML101930518), the applicant revised its response to EF3 COL 9.2.1-1-A, in Subsection 9.2.1.2 of the Fermi 3 COL FSAR to state the following:

"PSWS basin water is treated for biofouling, scaling, and suspended matter with biocides, anti-scalants, and dispersants, respectively. In addition, the anti-scalants and/or dispersants contain corrosion inhibitors as appropriate. This water treatment regime mitigates the long-term effects of fouling and corrosion within the PSWS.

PSWS materials are compatible with the PSWS water treatment regime. Based on the selected regime, carbon steel that meets ASTM standards is used as the pipe material for above-grade and below-grade portions of the PSWS. A corrosion protection system consistent with the guidance contained in ASME B31.1, Power Piping Code, Nonmandatory Appendix IV, Corrosion Control for ASME B31.1 Power Piping Systems is provided for the surfaces of buried piping systems. The buried sections of the piping are provided with waterproof protective coating and cathodic protection to control external corrosion."

The use of carbon steel to meet the American Society for Testing and Materials (ASTM) standard is consistent with the requirements for PSWS outlined in ESBWR DCD, Revision 10, Table 3.2-1, "Classification Summary," indicating that the PSWS is Quality Group D. The ESBWR DCD, Table 3.2-3, "Quality Group Designations – Codes and Industry Standards," states that Quality Group D piping is designed to ASME B31.1. Further, the buried portion of the carbon steel piping will have corrosion protection consistent with ASME B31.1, Power Piping Code, Nonmandatory Appendix IV, Corrosion Control for ASME B31.1. The buried section of the PSWS piping will be provided with waterproof protective coating and cathodic protection to control external corrosion. Based on the above, the staff has determined that the material

selection of the carbon steel and the provisions to preclude the long-term corrosion and fouling based on site water quality analysis are acceptable because these are consistent with ASME B31.1 code requirements for the PSWS in the nuclear power plants. Therefore, this RAI 09.02.01-3 is closed. Furthermore, the staff has confirmed the above FSAR markup provided in the referenced RAI response has been incorporated into the Fermi 3 COL FSAR.

In FSAR Revision 1, responding to this COL information item, the staff noted that the applicant only addressed the buried PSWS piping but did not address material selections for any other parts of the PSWS, including cooling towers and related components. Consequently, in RAI 09.02.01-4, the staff requested the applicant to provide additional information to specify and explain the material selections that pertain to the rest of the PSWS. The applicant's response dated January 29, 2010 (ADAMS Accession No. ML100331450), indicated that material selections for the PSWS (which include the AHS) will take into consideration PSWS water quality, water treatment options that are compatible with Lake Erie discharge limits, economic considerations, and DCD-related RTNSS criteria. In addition, the applicant provided a COL FSAR markup that stated carbon steel material will be utilized for above ground location and will meet ASTM standards.

Based on the review of this RAI response and FSAR markup the staff agrees that carbon steel material and referencing ASTM is a common industry practice for above ground SWS installations and finds this acceptable because the applicant addressed the previously missing information regarding what materials are to be utilized. Therefore, RAI 09.02.01-4 is closed. Furthermore, the staff has confirmed the above FSAR markup provided in the referenced RAI response has been incorporated into the Fermi 3 COL FSAR.

SRP Section 9.2.1 and Generic Letter (GL) 89-13, "Service Water System Problems Affecting Safety-Related Equipment" (as referred to by SRP Section 9.2.1), dated July 18, 1989, provide guidance for evaluating long-term corrosion and fouling considerations associated with SWS. In particular, these considerations include: (i) establishing a program of surveillance and control techniques to prevent flow blockage problems due to biofouling; (ii) establishing a routine inspection and maintenance program to assure that corrosion, erosion, protective coating failure, silting, biofouling and others that are applicable cannot degrade the PSWS defense-in-depth and the RTNSS cooling functions; and (iii) establishing a test program to verify (initially and periodically) the heat transfer capability of heat exchangers that are important to safety.

In order to prevent the long-term corrosion and fouling of the PSWS, the applicant proposes to chemically treat the water in the PSWS basin. Revision 1 of the FSAR did not explain (a) what specific vulnerabilities were considered to be pertinent based upon siting considerations and operational experience that applies, and (b) why chemical treatment alone was sufficient for addressing these vulnerabilities. While chemical treatment is a common practice and suitable for addressing service water system corrosion and fouling problems to some extent, it did not resolve all of the potential vulnerabilities that are referred to in SRP Section 9.2.1 and GL 89-13. In RAI 09.02.01-5, the staff requested the applicant to address the considerations referred to above and to fully address this COL information item.

In a letter dated January 29, 2010 (ADAMS Accession No. ML100331450), the applicant indicated that the PSWS is a closed system with makeup water treated to preclude long-term corrosion and fouling based on the site water quality analysis. The approach in maintaining the PSWS against its site-specific vulnerabilities reflects Detroit Edison's experience with Fermi Unit 2. The PSWS is a nonsafety-related system that is designated in the DCD as RTNSS, Criterion C, a "Low Regulatory Oversight, Maintenance Rule" support system. As a

Maintenance Rule system, system operation will be monitored for degradation, and deficiencies will be addressed. Consistent with the ESBWR DCD, Table 19A-2, the PSWS (including the AHS cooling towers) is a nonsafety-related system that is designated as a RTNSS Criterion C. The PSWS is subject to reliability and availability controls in accordance with the Maintenance Rule Program requirements. In addition, as stated in DCD Section 19A.8.2, all RTNSS systems are in the scope of the Design Reliability Assurance Program (D-RAP), as described in Fermi 3 COL FSAR, Section 17.4. Based on the staff's review of this RAI response, which addresses the site-specific vulnerabilities, applicable maintenance rule, and D-RAP, the staff has concluded that sufficient programmatic controls exist to address the potential vulnerabilities, GL 89-13, and the COL information item. Therefore, RAI 09.02.01-5 is closed.

The staff finds that the applicant has satisfactorily addressed COL information item EF3 COL 9.2.1-1-A because the applicant has adequately determined PSWS material selection and provided provisions to preclude the long-term corrosion and fouling based on site water analysis.

Supplemental Information

- EF3 SUP 9.2.1-1 Basin Reserve Storage Capacity

Table 9.2-201 provides supplemental plant-specific information (EF3 SUP 9.2.1-1) that specifies a basin reserve storage capacity of $9.08 \times 10^3 \text{ m}^3$ (2.4 million gallons), an ambient wet bulb temperature of 22.8 degrees Celsius (C) (73 degrees Fahrenheit(F)), and a heat load of 83.5 megawatts (MW) (2.85×10^8 British thermal units per hour (Btu)/hour) for each mechanical-draft cooling tower. The Fermi 3 COL FSAR supplemental information refers to FSAR Figure 9.2-205, "Plant Service Water System Simplified Diagram," for a diagram of the PSWS.

The staff reviewed Revision 1 of Fermi 3 COL FSAR, Table 9.2-201 and found that the Fermi 3 COL FSAR has the basin reserve storage capacity of $9.08 \times 10^3 \text{ m}^3$ (2.4 million gallons). The FSAR does not have any discussion on how the value was established. In RAI 09.02.01-6, the staff requested for the applicant to discuss how the water capacity of $9.08 \times 10^3 \text{ m}^3$ (2.4 million gallons) was established including the assumptions and methodology being used. In a letter dated January 29, 2010 (ADAMS Accession No. ML100331450), the applicant provided an analysis to demonstrate how to determine the basin capacity. In the analysis, the value of $9.08 \times 10^3 \text{ m}^3$ (2.4 million gallons) was established by determining the evaporation rate for the Auxiliary Heat Sink (AHS) using the heat load of 2.02×10^7 megajoules (MJ) (1.92×10^{10} Btu) over a 7-day period as defined in the DCD Revision 10. The staff reviewed the analysis of the assumptions and methodology, and determined it to be acceptable. Therefore, RAI 09.02.01-6 is closed.

Based on the above information, the staff finds that the applicant's supplemental information provided in EF3 SUP 9.2.1-1 for this subsection is acceptable because a $9.08 \times 10^3\text{-m}^3$ (2.4 million gallon) reserve water storage capacity is adequate based on a heat load of 2.02×10^7 MJ (1.92×10^{10} Btu) over a 7- day period that was used in the applicant's analysis.

Site-Specific Information Replacing Conceptual Design Information (CDI)

- EF3 CDI System Description
- EF3 CDI Table 9.2-201, "PSWS Component Design Characteristics"

In ESBWR DCD Tier 2, Subsection 9.2.1.2, states that the heat rejection facilities are dependent upon actual site conditions and are not part of the ESBWR standard plant. The conceptual design for the standard plant uses the NPWS and an AHS as the heat rejection facilities. The NPWS consists of a natural draft cooling tower and the AHS consists of mechanical draft cooling towers. A cross-tie for the standard plant permits aligning PSWS to either of these heat sinks.

The applicant provided conceptual design information (EF3 CDI) in Subsection 9.2.1.2 of the Fermi 3 COL FSAR to address this item and indicated that the PSWS rejects heat from the RCCWS and TCCWS heat exchangers to the environment via either the NPWS or the AHS. A natural draft cooling tower is utilized for the NPWS and mechanical draft cooling towers are utilized for the AHS. The FSAR provides a revised Table 9.2-201 that incorporates the cooling tower characteristics of the mechanical draft cooling towers. Table 9.2-201 provides supplemental plant-specific information (EF3 SUP 9.2.1-1) that specifies a basin reserve storage capacity of $9.08 \times 10^3 \text{ m}^3$ (2.4 million gallons), an ambient wet bulb temperature of 22.8 degrees C (73 degrees F), and a heat load at 83.5 MW ($2.85 \times 10^8 \text{ Btu/h}$). The Fermi 3 COL FSAR supplemental information refers to FSAR Figure 9.2-205, "Plant Service Water System Simplified Diagram," for a schematic diagram of the PSWS.

Tier 2 of the DCD, Subsection 9.2.1.2, indicates that the heat rejection facilities are dependent upon actual site conditions and provides CDI for the standard plant design. Subsection 9.2.1.2 of the Fermi 3 COL FSAR replaced the CDI with plant-specific information (EF3 CDI), indicating that the heat rejection facility for Fermi 3 consists of natural draft and mechanical draft cooling towers. In order for the NRC to determine if the cooling towers are capable of performing their defense-in-depth and RTNSS functions, the staff issued RAI 09.02.01-7, requesting the applicant to address cooling tower design attributes, plant-specific vulnerabilities and degradation mechanisms, programmatic controls, and potential impacts on safety-related SSCs resulting from postulated cooling tower failures.

In a letter dated January 29, 2010 (ADAMS Accession No. ML100331450), the applicant stated that sufficient information was provided in FSAR Subsection 9.2.1.2 subsection of the "Detailed Design Description" with its referenced tables to demonstrate that PSWS is capable of meeting its RTNSS functions. For example, maximum allowed PSWS water supply temperature (cold leg temperature), limiting meteorological assumptions (ambient wet bulb temperature), heat dissipation capability, and water inventory requirements are listed in FSAR Table 9.2-201. The minimum net positive suction head for the PSWS pumps is ensured by maintaining the required water inventory above pump minimum submergence. The minimum water inventory requirements are met by maintaining the level at or above the minimum operating level in the cooling tower basin. Each PSWS cooling tower has a heat rejection capacity much greater than the RTNSS heat load. Therefore, each tower is capable of meeting the system's RTNSS function to support the required cooling of the RCCWS. Preoperational and startup testing is conducted to demonstrate that the PSWS can perform its intended functions. Those testing requirements are described in DCD Subsections 14.2.8.1.51 and 14.2.8.2.18, respectively. Operational functionality is assured by the normal operation and monitoring of the system. The specific vulnerabilities and degradation mechanisms that are anticipated, based on operational experience and site location, are long-term corrosion and fouling. Subsection 9.2.1.2 of the

FSAR states that PSWS water is chemically treated to preclude long-term corrosion and fouling of the PSWS based on site water quality analysis. The failure of cooling tower components will not cause the potential for any adverse impacts on the intended design functions of the safety-related SSCs. Water from a postulated PSWS cooling tower riser break will drain eastward and southward away from any power block structures because of the slope of the elevated plateau the power block structures are to be built on. Based on the RAI response and staff's review of the above information, the staff has determined that the cooling towers are capable of performing their intended functions. Therefore, RAI 09.02.01-7 is closed.

Revision 1 of Fermi 3 COL FSAR Subsection 9.2.1.2 specifies that during operation, PSWS flow is directed either to the NPHS cooling tower or the AHS cooling tower where heat removed from the RCCWS and TCCWS is rejected. During this mode of operation using NPHS, the NPHS basin provides makeup to the AHS basin. During the mode of operation using AHS, the SWS provides makeup to the AHS basin. While this supplemental information explains how makeup is provided to the AHS depending on how the PSWS is aligned for heat rejection, it is not clear what the different "modes" of power operation are. This is confusing because the term "mode" has a specific meaning in the Technical Specifications (TSs), and specific modes of power operation are not assigned for when the NPHS or the AHS should be used. In RAI 09.02.01-8, the staff requested the applicant to revise the FSAR to eliminate this confusion and to better explain when the NPHS versus the AHS will be used for various operating, transient, and accident conditions. In a letter dated January 29, 2010 (ADAMS Accession No. ML100331450), the applicant revised the FSAR section in question. It reads "During normal power operation, PSWS flow is directed to either the NPHS cooling tower or the AHS cooling towers where heat removed from the RCCWS and TCCWS is rejected. When PSWS uses the NPHS, the NPHS basin provides makeup to the AHS basin. When PSWS uses the AHS, makeup to the AHS basin is provided from the Station Water System (SWS)." The staff determined the revised FSAR resolved the confusion in question. Therefore, this RAI 09.02.01-8 is closed. Further, the staff has confirmed the above FSAR markup provided in the referenced RAI response has been incorporated into the Fermi 3 COL FSAR.

Based on the above information, the staff finds that the site-specific CDI provided by the applicant in this subsection is acceptable because the applicant has adequately described the function and components of the NPHS and the AHS.

Interface Requirement

Tier 1 of the ESBWR DCD, Section 4.1, specifies an interface requirement that the PSWS plant-specific heat rejection facilities must be capable of supporting the post-72 hour RTNSS cooling function of the PSWS. In particular, the PSWS must be capable of removing at least 2.02×10^7 MJ (1.92×10^{10} Btu) over a period of 7 days without active makeup. In addition, the PSWS pumps must have sufficient available NPSH at the pump suction location for the lowest probable water level of the heat sink. The COL applicant is required to develop plant-specific ITAAC that demonstrate that each train of the plant-specific cooling tower and basin satisfies this interface requirement.

The applicant provided plant-specific ITAAC item, "ITAAC for Plant Service Water Reserve Storage Capacity," for the PSWS in Section 2.4.3, "ITAAC for Plant Service Water System (Portion Outside the Scope of the Certified Design)," Table 2.4.3-1, "ITAAC for Plant Service Water Reserve Storage Capacity," of COLA Part 10. The proposed Design Commitment is for the PSWS to contain an inventory of cooling water sufficient for removing post-72- hour heat from the RCCWS for a period of seven days without active makeup. The proposed Acceptance

Criteria are to document that the usable water volume in the PSWS basins is sufficient to remove 2.02×10^7 MJ (1.92×10^{10} Btu) over a period of seven days without active makeup.

SRP Section 9.2.5 and RG 1.27, "Ultimate Heat Sink for Nuclear Power Plants" (as referred to by SRP Section 9.2.5), provide guidance for evaluating the adequacy of cooling towers. Important factors that need to be considered when demonstrating that cooling towers are capable of dissipating the required heat load include (among other factors) the capability to satisfy the PSWS pump's minimum NPSH requirements for the most limiting cooling tower basin water level; the maximum allowed PSWS water supply temperature; and the most limiting meteorological assumptions that pertain to the site for determining the heat dissipation capability, and the water inventory requirements. Transient analyses that take these factors into consideration (including margin for expected degradation and operating flexibility) and confirmatory testing are usually necessary in order to demonstrate that the cooling tower performance satisfies the specified heat removal capability.

The ITAAC proposed by the applicant specifies the PSWS basin water inventory requirement as a way of demonstrating that the heat removal capability specified by the DCD has been satisfied. However, the applicant provided no explanation or description for other attributes such as how this water inventory requirement was established, cooling tower design attributes, the capability to satisfy the PSWS pump's minimum NPSH requirements, temperature and flow conditions, the maximum allowed PSWS water supply temperature, and the most limiting meteorological assumptions that pertain to the site. While water inventory is an important consideration for assuring that the cooling towers are capable of performing their defense-in-depth and RTNSS functions, the review considerations discussed in the paragraph above were not addressed by the applicant and the proposed ITAAC do not adequately demonstrate that the cooling towers are capable of dissipating the specified heat load. The staff asked the applicant in RAI 09.02.01-1 to address the considerations referred to above and to revise the FSAR and ITAAC accordingly.

In the letters dated January 29 and July 9, 2010 (ADAMS Accession Nos. ML100331450 and ML101930518, respectively), the applicant responded to RAI 09.02.01-1. In these responses, the applicant stated that the capability of the PSWS cooling towers is based on the typical design attributes associated with the design of nonsafety-related systems utilizing cooling towers. The minimum heat duty for each tower is 83.5 MW (2.85×10^8 Btu/hour) and the design uses ambient wet bulb temperature of 22.8 degrees C (73 degrees F), an approach temperature of 8.3 degrees C (47 degrees F), and a cold water (supply) temperature of 31.1 degrees C (88 degrees F). The system's normal loads are from the RCCWS and TCCWS and the system is designed as a nonsafety-related system to perform a cooldown assuming a loss of preferred power (LOPP) and a single train operation. Initial testing of the system includes the performance testing of the cooling towers for conformance with design heat loads and waterflows. This information is incorporated by reference from the DCD in FSAR Section 9.2.1, with the necessary supplements.

Furthermore, the applicant stated that during a postulated event where the PSWS functions as a RTNSS Criterion C system, the normal makeup water to the cooling tower is not qualified as a RTNSS function and is considered to be unavailable. The cooling tower basin must have a sufficient volume of water to allow the tower to perform its cooling function without active makeup.

In addition, the applicant revised acceptance criteria to state that the volume of water in the PSWS heat sink is sufficient to remove 2.02×10^7 MJ (1.92×10^{10} Btu) over a period of 7 days

without active makeup. Also the applicant provided a design commitment and acceptance criteria confirming that there is sufficient available net positive suction head at the PSWS pump suction location for the lowest probable water level of the heat sink. In addition, the applicant provided a markup to Fermi 3 COLA, Part 10, Tier 1 ITAAC, Section 2.4.3, and Table 2.4.3-1.

The staff finds the applicant's response is acceptable because it is consistent with the ESBWR DCD, Tier 1, Revision 6, Section 4.1 "Plant Service Water System," Interface Requirements. The staff finds this RAI response acceptable since it satisfies DCD Tier 1, Section 4.1, Interface Requirement. The staff confirmed the above change was incorporated into Fermi 3 COLA, Revision 3. Therefore, RAI 09.02.01-1 is closed.

The staff's review of Revision 1 of the COLA application identified that the proposed ITAAC did not address the interface requirement that the PSWS pumps must have sufficient NPSH at the pump suction location for the lowest probable water level of the heat sink. In RAI 09.02.01-2, the staff asked the applicant, to address the NPSH in the ITAAC. In the letter, dated January 29, 2010 (ADAMS Accession No. ML100331450), the applicant, as a part of the response to RAI 09.02.01-1, provided the requested change in Revision 2 of Fermi 3 COL application, Part 10, Tier 1, ITAAC, Section 2.4.3, and Table 2.4.3-1. The revised information states that the PSWS pumps must have sufficient NPSH at the pump suction location for the lowest probable water level. The staff's review of the above information as a part of RAI 09.02.01-1 finds it acceptable because the commitment is consistent with the DCD Tier 1, Section 4.1, interface requirement. Therefore, RAI 09.02.01-2 is closed.

The staff finds that the applicant has satisfactorily addressed this interface requirement because the PSWS plant-specific heat rejection facilities are capable of supporting the post-72 hour RTNSS cooling function and the PSWS pumps have sufficient available NPSH for the lowest probable water level of the heat sink.

ITAAC

As specified in the Fermi 3 COL application, Part 10, Section 1, the ITAAC from Tier 1 of the DCD is incorporated by reference. However, in Part 10, Section 2.4.3 the applicant proposes ITAAC for the interface requirement that is specified in Section 4.1 of the DCD Tier 1. The adequacy of the proposed plant-specific ITAAC that are proposed is evaluated above under "Interface Requirements." The applicant's responses to RAI Questions 09.02.01-1 and 09.02.01-2 were reviewed and determined to be acceptable in the above staff's evaluation.

Initial Plant Test Program

As indicated in the FSAR, Section 14.2, "Initial Plant Test Program for Final Safety Analysis Reports," the initial plant test program specified in DCD Tier 2 for the PSWS is incorporated by reference. The PSWS initial test program is discussed in the DCD Tier 2, Subsections 14.2.8.1.51, "Plant Service Water System Preoperational Test," and 14.2.8.2.18, "Plant Service Water System Performance Test." However, these tests do not verify that performance of the PSWS (including the NPHS and AHS) satisfies design specifications for all configurations and heat loads. In RAI 09.02.01-9, the staff asked the applicant to establish and describe initial plant test program requirements for the PSWS accordingly.

In the response to this RAI dated January 29, 2010 (ADAMS Accession No. ML100331450), the applicant stated that "preoperational and startup testing requirements for the PSWS, which includes the CDI portion of the PSWS (including AHS), are described in DCD Sections 9.2.1.4,

14.2.8.1.51, and 14.2.8.2.18. The DCD is incorporated by reference into the COLA FSAR.” The two mechanical draft cooling towers in the AHS are specific to Fermi 3 but are an integral part of the PSWS. Preoperational and startup testing of the AHS will occur during the initial test program for the PSWS. Such testing will demonstrate the proper functioning of the PSWS and its components, including the AHS, under various operational configurations. Performance testing of the PSWS using the NPHS is not required because of the operational conditions in which the NPHS is allowed to be used. When the NPHS is used in conjunction with PSWS during normal power operation, the AHS cooling towers are not in use. If the NPHS is insufficient, then the AHS must be used. Performance testing done using the AHS is sufficient. In addition, in the response to RAI 09.02.01-9, the applicant proposed revisions to FSAR Subsections 14.2.8.1.51 and 14.2.8.2.18 by adding supplemental information EF3 SUP 14.2-4 and EF3 SUP 14.2-5 in order to clarify the purpose and criteria of the PSWS preoperational test, along with the purpose and description of the PSWS performance test.

Based on the staff’s review of this RAI response, the staff finds the applicant has addressed the identified shortcomings in the RAI for the initial test program related to the AHS in the CDI. In addition, the staff finds that the water hammer design features had been added and had been adequately addressed to ensure the CDI had been properly tested. Therefore, this RAI 09.02.01-9 is closed. Furthermore, the staff has confirmed that the above FSAR markup provided in the referenced RAI response is incorporated into the Fermi 3 COL FSAR.

9.2.1.5 Post Combined License Activities

There are no post COL activities related to this section.

9.2.1.6 Conclusion

The NRC staff’s finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirms that the applicant has addressed the required information relating to the PSWS, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the PSWS that were incorporated by reference are resolved.

In addition, the staff compared the additional COL information in the application to the relevant NRC regulations, the guidance in Section 9.2.1 of NUREG–0800, and other NRC regulatory guides. The staff’s review concludes that the applicant’s information is acceptable and meets the requirements of GDC 2, 4, 44, 45,46, and 10 CFR 52.80(a). The staff has evaluated COL Items EF3 COL 9.2.1-A, EF3 SUP 9.2.1-1, EF3 CDI, along with the DCD ITAAC and Interface Requirement for this subsection to the relevant NRC regulations and acceptance criteria in Sections 9.2.1 and 9.2.5 of NUREG-0800. The staff’s evaluation finds that the applicant has satisfactorily addressed these items.

9.2.2 Reactor Component Cooling Water System

Subsection 9.2.2 of the Fermi 3 COL FSAR incorporates by reference Section 9.2.2, “Reactor Component Cooling Water System”, of Revision 10 of the certified ESBWR DCD, Revision 10 referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to

this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to RCCWS that were incorporated by reference are resolved.

9.2.3 Makeup Water System

9.2.3.1 Introduction

The makeup water system (MWS) provides high purity demineralized water to various plant systems. The MWS consists of two subsystems; a demineralization subsystem and a storage and transfer subsystem. Feedwater for the demineralization subsystem is provided by the Frenchtown Township municipal water system. Treated water is stored in a demineralized water storage tank and distributed throughout the plant using transfer pumps. Except for the piping penetrating the containment and the associated containment isolation valves, the MWS is not safety-related. However, if available, the MWS can provide makeup to the isolation condenser/passive core cooling (IC/PCC) pool following an anticipated operational occurrence (AOO) or any abnormal event.

9.2.3.2 Summary of Application

Section 9.2.3 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.2.3 of the certified ESBWR DCD, Revision 10. In addition, in FSAR, Section 9.2.3, the applicant provides the following:

Site Specific Information Replacing Conceptual Design Information

- EF3 CDI System Description

The applicant provided site-specific information to replace the CDI contained in the ESBWR DCD. The applicant added activated carbon filters upstream of the reverse osmosis unit based on site specific considerations. The MWS major equipment is housed entirely in the service water/water treatment building except for the demineralized 950 m³ (250,963 gallon) water storage tank (which is outdoors and adjacent to this building) and the distribution piping to the interface systems. Freeze protection is provided for the demineralized water storage tank and piping exposed to freezing conditions. Table 9.2-202, "Major Makeup Water System Components," in the Fermi 3 COL application lists the major MWS components.

ITAAC

In COL application Part 10, Section 2.4.10, the applicant states that for the MWS there are no entries.

9.2.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, there is no associated SRP section in NUREG-0800 for the MWS.

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

The applicable regulatory requirements for the site specific aspects of the MWS are:

- GDC 2, in that failure of the nonsafety-related system or component due to natural phenomena such as earthquakes, tornadoes, hurricanes, and floods should not adversely affect SSCs important to safety
- RG 1.29, Revision 4 “Seismic Design Classification,” Revision 4, March 2007
- 10 CFR 52.80(a), which requires the applicant to address ITAAC

9.2.3.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Subsection 9.2.3 of the certified ESBWR DCD. The staff reviewed Section 9.2.3 of the Fermi 3 COL FSAR and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff’s review confirms that the information in the application and the information incorporated by reference address the required information related to the MWS.

The staff’s review of FSAR Subsection 9.2.3 is limited to the following Fermi 3 COL FSAR site-specific design replacing the CDI in the ESBWR DCD, Revision 10.

Site-Specific Information Replacing Conceptual Design Information

- EF3 CDI FSAR Subsection 9.2.3.2, “System Description.”

In FSAR Subsection 9.2.3.2, the applicant replaced the introductory text and demineralization subsystem portions of the ESBWR DCD, Subsection 9.2.3.2. In FSAR Subsection 9.2.3.2, the applicant provided site-specific system description of the MWS.

The MWS consists of two subsystems: (1) the demineralization subsystem and (2) the storage and transfer subsystem. The makeup water transfer pumps and the demineralization subsystem are sized to meet the demineralized water needs of all operational conditions except for the shutdown/refueling/startup mode. During the shutdown/refueling/startup mode, the increases in plant water consumption may require the use of a temporary demineralization subsystem and temporary makeup water transfer pumps to be used as a supplemental water source.

The MWS major equipment is housed entirely in the service water/water treatment. Building except for the demineralized water storage tank (which is outdoors and adjacent to this building) and the distribution piping to the interface systems. Freeze protection is provided for the demineralized water storage tank and piping exposed to freezing conditions.

The staff reviewed the site-specific MWS and its components and finds that the applicant’s proposed system design is similar to the MWS described in Subsection 9.2.3.2 of the ESBWR DCD, Revision 10. The EF3 MWS components and associated piping in contact with

¹ See “Finality of Referenced NRC Approvals” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

demineralized water are fabricated from corrosion resistant materials such as stainless steel to prevent contamination of the makeup water.

Demineralization Subsystem

Water for the demineralization subsystem is provided by the Frenchtown Township municipal water system. Production of demineralized water by the demineralization subsystem can be initiated and shut down either automatically (based on the demineralized water storage tank level) or manually. Feedwater is treated in the following sequence via activated carbon filters, reverse osmosis modules, and mixed bed demineralizers.

Each reverse osmosis module includes cartridge filters. The reverse osmosis modules are separated by an inter-stage break tank. Chemical addition is provided upstream of the reverse osmosis module cartridge filters as required. High pressure pumps provide the pressure required for flow through the reverse osmosis unit membranes. The reverse osmosis unit reject flow is sent to the blowdown. The reverse osmosis product water is temporarily stored in an reverse osmosis product water storage tank before being pumped by one of the forwarding pumps to the mixed bed demineralizer unit. Operation of the reverse osmosis high-pressure pumps is interlocked with that of the forwarding pumps. The mixed bed demineralizer consists of both strong cation and anion resins in the same vessel that polishes the reverse osmosis product water. The mixed bed unit effluent is monitored for water quality. This effluent is automatically recirculated to the station water storage tank (SWST) until the water quality requirements are met. Makeup water is then delivered to the MWS demineralized water storage tank. The modular design of the reverse osmosis unit and the mixed bed unit allows continuous demineralized water production. Cleaning, back flushing, or module removal are manual operations based on elevated differential pressure across the module or total flow through the system. No regeneration of mixed bed modules is performed on-site.

The NRC reviewed the design information provided in the FSAR Subsection 9.2.3 for the Fermi 3 COL FSAR MWS and finds that the applicant did not identify any further supplements and/or departures, except the site-specific information discussed above. The site-specific portion of the MWS is nonsafety-related and its failure does not compromise any safety-related system or component nor does it prevent a safe-shutdown. Also, the site-specific design will not change the conclusion of ESBWR DCD for MWS, as it relates to GDC 2.

Furthermore, the site-specific portion of the MWS does not interface with any potentially radioactive system. Therefore, no interface requirements needed to be satisfied. Because of the above information, the site-specific portion of the design provided in the Fermi 3 COL application does not affect the conclusions in the ESBWR FSER (NUREG-1966).

The staff finds that the site-specific conceptual design information for the MWS presented within this subsection of the Fermi 3 COL FSAR is acceptable and does not change the conclusions of ESBWR DCD, as it relates to GDC 2. The staff also finds that the EF3 CDI for the MWS meets the guidance of Regulatory Position C.2 of RG 1.29 regarding nonsafety-related systems because the failure of the nonsafety-related portions of the systems does not impact any safety-related SSCs.

ITAAC

In COL application Part 10, Section 2.4.10 described the site-specific ITAACs for the MWS. The staff reviewed this section for the MWS against selection criteria in SRP Section 14.3. The

staff's review concludes that the MWS does not perform a safety-related function and is not considered a system "important to safety;" therefore, as-built verification, i.e., a site-specific ITAAC, is not required.

9.2.3.5 Post Combined License Activities

There are no post COL activities related to this section.

9.2.3.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the MWS, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the MWS that were incorporated by reference are resolved.

In addition, the staff compared the additional information in the application to the relevant NRC regulations and other NRC regulatory guides. The staff's review concludes that the applicant has provided sufficient information on the site-specific conceptual design information for the MWS presented within this subsection of the Fermi 3 COL FSAR. The staff finds that the information is acceptable and does not change the conclusions of ESBWR DCD. The staff also finds that the EF3 CDI for the MWS meets the guidance of Regulatory Position C.2 of RG 1.29 regarding nonsafety-related systems because the failure of the nonsafety-related portions of the systems does not impact any safety-related SSCs. With respect to MWS failures and GDC 2, SSCs important to safety are able to withstand the effects of natural phenomena without loss of capability to perform their safety function. The staff finds that these requirements have been met.

Additionally, the staff concludes that the applicant has adequately addressed 10 CFR 52.80(a). The staff confirms that COL ITAACs are not required for the MWS.

9.2.4 Potable and Sanitary Water Systems

9.2.4.1 Introduction

The potable water system (PWS) supplies clean water for domestic use and human consumption. The sanitary waste discharge system (SWDS) collects and treats sanitary wastes from plant restrooms and locker room facilities. The system design ensures that there is no possibility for radioactive contamination of the potable water or the sanitary waste drainage system. Neither the PWS nor the SWDS has a safety design basis.

9.2.4.2 Summary of Application

Section 9.2.4 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.2.4 of the certified ESBWR DCD, Revision 10. In addition, in FSAR, Section 9.2.4, the applicant provides the following:

Site Specific Information Replacing Conceptual Design Information

- EF3 CDI Potable and Sanitary Water Systems

The applicant provided additional information to replace CDI contained in the ESBWR DCD. The applicant described the site specific potable and sanitary water system. The PWS is supplied by the Frenchtown Township municipal water system. The sanitary wastes are collected and forwarded to the Frenchtown Township Sewage Treatment facility. Neither the PWS nor the SWDS interconnects with any system that contains radioactive fluids. The sanitary waste system is monitored for radioactivity. The applicant provided Figure 9.2-201, "Potable Water System Simplified Diagram," depicting the potable water system and Figure 9.2-202, "Sanitary Waste Discharge System Simplified Diagram," depicting the SWDS. Table 9.2-203, "Potable Water System Component Design Characteristics," provides information about major PWS components.

ITAAC

In COL application Part 10, Section 2.4.7, the applicant states that for the PWS and SWDS there are no entries.

9.2.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the potable and sanitary water systems and the associated acceptance criteria are in Section 9.2.4 of NUREG-0800.

The applicable regulatory requirements for the potable and sanitary water system are as follows:

- GDC 60, "Control of releases of radioactive materials to the environment," of 10 CFR Part 50, Appendix A which relates to design provisions provided to control the release of liquid effluents containing radioactive material from contaminating the PSWS.
- 10 CFR 52.80(a), which requires the applicant to address the ITAAC.

Since the PWS/SWDS may affect SSCs due to nonsafety-related equipment failures, additional regulatory requirements for the potable and sanitary water system are as follows:

- GDC 2 as it relates to structures housing the system and the system itself having the capability of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes and floods without loss of safety-related functions.
- GDC 4 as it relates to effects of missiles inside and outside of the containment, pipe whip, jets, and environmental conditions from high and moderate energy line breaks and dynamic effects of flow instabilities and loads (e.g. water hammer) during normal plant operation, as well as during accident conditions.

9.2.4.4 *Technical Evaluation*

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.2.4 of the certified ESBWR DCD. The staff reviewed Section 9.2.4 of the Fermi 3 COL FSAR and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that information in the application and the information incorporated by reference address the required information related to the PWS.

The staff reviewed the relevant information in the COL FSAR:

Site-Specific Information Replacing Conceptual Design Information

- EF3 CDI Potable and Sanitary Water Systems

The staff reviewed EF3 CDI related to the conceptual design of the PSWS included under Section 9.2.4 of the Fermi 3 COL FSAR including Figures 9.2-201 and 9.2-202, and Table 9.2-203. Meeting the requirements of GDC 60 for this system ensures that design provisions are in place to prevent liquid effluents containing radioactive materials from contaminating the PWS and SWDS and potentially being released to the environment.

The PWS and SWDS do not perform any safety-related function and are not connected to any safety-related systems. A failure of these systems does not affect any safety-related components or prevent a safe shutdown of the plant.

The proposed source of potable water for the PWS is treated water from the Frenchtown Township municipal water system, at a supply capacity of 12.6 liters per second (L/s) (200 gallons per minute [gpm]). The applicant stated in the application that the water quality will meet the standards of the authorities having jurisdiction. The PWS does not handle radioactive fluids, and it is not connected to and does not interface with any system potentially containing radioactive fluids. However, potable water is supplied to areas where potential backflow could cause radiological contamination. In the unlikely event of radiological intrusion into the PWS in these areas, the applicant has proposed using of backflow preventers to preclude the spread of contamination into the PWS. The staff concludes that because the PWS is not connected to or does not interface with systems that contain radioactivity, and backflow preventers are installed in areas of potential contamination, acceptable design provisions have been included to prevent the inadvertent contamination of the PWS with radioactive material.

The proposed Fermi 3 SWDS consists of a waste basin, wet well, septic tank, settling tank, and associated pumps. The sewage is routed from the septic tank to the Frenchtown Township Sewage Treatment facility and is not discharged to the environment. The SWDS does not handle radioactive fluids. It is not connected to and does not interface with any system potentially containing radioactive fluids. Analyses of routing septic tank grab samples, which is described in COL FSAR Table 11.5-201, "Provisions for Sampling Liquid Streams" will detect events that might contaminate the SWDS downstream of the septic tanks and are also discussed in Section 11.5 of this SER. In the event that radioactivity is detected above predetermined limits, controls are in place to prevent the offsite disposal of sewage sludge prior

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

to on-site evaluation of potential radiological contamination and treatment when contamination is beyond acceptable limits.

Fermi 3 COL FSAR, Section 9.2.4, describes the PWS and SWDS and that failure of the system does not compromise any safety-related equipment or component and does not prevent safe shutdown of the plant. In addition, Table 9.2-203, "Potable Water System Component Design Characteristics" states that the PWS design includes a potable water storage tank capacity of 75.7 m³ (20,000 gallons). Since the exact location of the potable water storage tank was not specified in Revision 3 of the COL FSAR, the staff could not conclude that if an event were to occur that affects the integrity of the potable water storage tank and flooding occurs, SSCs would not be affected. For this reason, the staff issued RAI 09.02.04-1 asking the applicant to address the following five items:

1. The exact location of the potable water storage tank with respect to building or yard location.
2. Discussion of the potable water storage tank and any bounding flooding analysis in Sections 3.4 and 9.2.4 of the COL FSAR and any effects on safety-related SSCs. If the tank is located in the yard, discuss the site grading around the tank and direction of water away from safety-related SSCs.
3. Discussion of this potable water storage tank and any bounding flooding analysis in Sections 3.4 and 9.2.4 of the COL FSAR and any effects on the nonsafety-related SSCs that are designated as "Regulatory Treatment of Nonsafety-Related Systems" (RTNSS) SSCs. If the tank is located in the yard, discuss the site grading around the tank and direction of water away from RTNSS SSCs.
4. Discussion in Section 9.2.4 of the PWS and SWDS, specifically the potable water storage tank, related to GDC 2 (protection against natural phenomena such as earthquakes).
5. Discussion in Section 9.2.4 of the PWS and SWDS, specifically the potable water storage tank, related to GDC 4 (protection against environmental and dynamic effects) as it related to discharging fluids which may result from PWS and SWDS equipment failures.

The applicant responded to RAI 09.02.04-1 in letters dated August 12 and 26, 2011 (ADAMS Accession Nos. ML11228A127 and ML11241A195, respectively) and provided the following:

The potable water storage tank will be located inside the water treatment/service water building. There are no safety-related SSCs in the water treatment/service water building. In the event that a failure of the potable water storage tank resulted in water exiting the water treatment/service water building, the water would flow away from any safety-related SSCs as shown on the final grade drainage area figures, FSAR Figure 2.4-215, "Final Grade Drainage Area," and Figure 2.4-217, "Final Grade Drainage Area Assuming Clogged Underground Storm Drains and Culverts". The plant service water system (PSWS) is classified as a regulatory treatment of nonsafety-related systems (RTNSS) system with components located inside and outside the water treatment/service water building. Per ESBWR DCD Table 19A-4, "Capability of RTNSS Related Structures," design and installation of RTNSS equipment in the water treatment/service water building includes protection from the effects of internal flooding

and PSWS equipment located outdoors includes protection from flooding. Therefore, RTNSS equipment located inside and outside the water treatment/service water building will be protected from flooding caused by a postulated failure of the potable water storage tank.

As stated in FSAR Subsection 9.2.4.3, the PWS and SWDS are not safety-related and do not connect to any safety-related systems. As described above, failure of the potable water storage tank would not adversely impact any safety-related or RTNSS SSCs; therefore, those safety-related and RTNSS SSCs satisfy 10 CFR Part 50, Appendix A, Criteria GDC 2 and GDC 4. A FSAR markup was provided which describes the potable water tank to be located in the water treatment/service water building and the potable water storage tank has been evaluated with respect to GDC 2 and 4.

The staff reviewed the applicant's responses to RAI 09.02.04-1. The staff's review finds the responses acceptable because the postulated failure of the potable water storage tank does not adversely affect safety-related or RTNSS SSCs. Since the potable water storage tank is located in the water treatment/service water building, water would flow away from any safety-related SSCs. The RTNSS SSCs are protected from the effects of internal flooding and the PSWS located outdoors are protected from flooding. For example, flooding protection is provided by adequate building seals and or access building openings above flood levels. The staff finds the FSAR markups provided by the applicant to be acceptable. Therefore, the staff has determined that RAI 09.02.04-1 is resolved. The applicant's proposed revisions to the Fermi 3 COL FSAR were tracked as Confirmatory Item 9.2.4-1. The staff confirmed that these changes have been incorporated into the Fermi 3 COL FSAR. Therefore, Confirmatory Item 9.2.4-1 and RAI 09.02.04-1 are closed.

Based on the staff's review of the applicant's information for the PWS and SWDS, the staff finds that the applicant has made acceptable design to prevent the inadvertent contamination of the systems with radioactive material, and therefore the proposed design of the PSWS meets the requirements of GDC 60 and therefore is acceptable.

No departures or COL information items are identified in this section. The TSs, ITAAC, and initial plant test program are not applicable for these systems. There is no ESBWR DCD Tier 1 interface associated with these systems.

The staff finds that the site-specific CDI presented within this subsection of the Fermi 3 COL FSAR is acceptable and meets the requirements of GDC 2, 4, and 60. The staff bases its conclusion on the fact that the potable and sanitary water systems have no safety-related function and failure of the system would not compromise any safety-related system or component, nor would it prevent a safe shutdown of the plant. The EF3 CDI for the PWS and SWDS have no interface with any safety-related equipment, and no interconnections exist between the PWS and SWDS and any potentially radioactive system. In addition, flooding consequences from the PWS storage tank was evaluated and determined to be acceptance since safety-related or RTNSS SSCs would not be negatively affected from performing their intended functions.

ITAAC

In COL application Part 10, Section 2.4.7 describes the site-specific ITAACs. The staff reviewed this section for the PWS and SWDS against selection criteria in SRP Section 14.3. The staff concludes that the PWS and SWDS do not perform a safety-related function and are not considered a system “important to safety;” therefore, as-built verification, i.e., site-specific ITAAC, is not required.

9.2.4.5 Post Combined License Activities

There are no post COL activities related to this section.

9.2.4.6 Conclusion

The NRC staff’s finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff’s review confirmed that the applicant has addressed the required information relating to the potable and sanitary water systems, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the potable and sanitary water systems that were incorporated by reference are resolved.

In addition, the staff compared the additional supplemental information in the application to the relevant NRC regulations, the guidance in Section 9.2.4 of NUREG–0800, and other NRC regulatory guides. The staff concludes that the applicant’s information on site-specific conceptual design in this section of the Fermi 3 COL FSAR is acceptable and meets the requirements of GDC 2, 4, and 60.

The staff bases its conclusion on the fact that the potable and sanitary water systems have no safety-related function and failure of the system would not compromise any safety-related system or component, nor would it prevent a safe shutdown of the plant. The EF3 CDI for the PWS and SWDS have no interface with any safety-related equipment, and no interconnections exist between the PWS and SWDS and any potentially radioactive system. In addition, flooding consequences from the PWS storage tank was evaluated and determined to be acceptance since safety-related or RTNSS SSCs would not be negatively affected from performing their intended functions.

Additionally, the staff concludes that the applicant has adequately addressed 10 CFR 52.80(a). The staff confirmed that COL ITAACs are not required for the PWS and SWDS.

9.2.5 Ultimate Heat Sink

9.2.5.1 Introduction

Section 9.2.5 of the ESBWR DCD Tier 2, Revision 10, describes the ultimate heat sink (UHS). The UHS consists of the isolation condenser (IC) and the passive containment cooling (PCC) pools, the dryer/separator pool and reactor well, fire protection system (FPS) makeup water for the IC/PCC pools, and SFP from the primary (Seismic Category I) firewater storage tanks via the safety-related fuel and auxiliary pools cooling system (FAPCS) piping, and other water sources that are credited for providing makeup water for the IC/PCC pools, and the SFP after water from the firewater storage tanks has been depleted. The dryer/separator pool and reactor

well provide sufficient makeup water for the IC/PCC expansion pools to support operation of the IC System and PCC systems during the initial 72 hours following an accident. A source of makeup water for the SFP is not credited during this period. After the initial 72 hours, the FPS is relied upon for supplying the necessary makeup water for the IC/PCC pools and the SFP for up to seven days. The parts of the UHS that are relied upon for the first 72 hours following an accident are safety-related and are evaluated in Section 5.4, “Reactor Coolant System Component and Subsystem Design,” and Section 6.2.2, “Passive Containment Cooling System” of this SER. The parts of the UHS that are relied upon for providing makeup water during the period from 72 hours through seven days post-accident are not required to be safety-related, but must be readily available on-site and are subject to RTNSS as discussed in Chapter 19A, “Regulatory Treatment of Non-Safety Systems,” of the ESBWR DCD, Revision 10. This section evaluates the adequacy of the capability that is credited for providing makeup water to the IC/PCC pools, and SFP after the initial seven days have elapsed following an accident.

9.2.5.2 Summary of Application

Section 9.2.5 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Subsection 9.2.5 of the certified ESBWR DCD, Revision 10. In addition, in FSAR Section 9.2.5, the applicant provides the following:

COL Item

- STD COL 9.2.5-1-A Post Seven Day Makeup to Ultimate Heat Sink (UHS)

The applicant provided additional information in FSAR Section 9.2.5 to address DCD COL Item 9.2.5-1-A. The applicant committed (COM 9.2-001) to provide procedures that identify and prioritize available makeup water 7 days after an accident and provide instructions for establishing the necessary connections. The procedures will be developed in accordance with the procedure development milestone in Section 13.5.

9.2.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the UHS and the associated acceptance criteria are in Section 9.2.5 of NUREG-0800.

The applicable regulatory guidance for the evaluation of COL 9.2.5-1-A is as follows:

- GDC 2, 4, 44, 45, and 46
- GDC 5, “Sharing of structures, systems and components”
- RG 1.206, as it relates to the applicant’s cited commitment (COM) in this section

9.2.5.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.2.5 of the certified ESBWR DCD. The staff reviewed Section 9.2.5 of the Fermi 3 COL FSAR and checked the referenced ESBWR DCD to ensure that the combination of the information in the

COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that the information in the application and information incorporated by reference address the required information related to the UHS.

Section 1.2.3 of this SER discusses the NRC's strategy for performing one technical review for each standard issue outside the scope of the design certification (DC) and to use this review to evaluate subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER with open items issued for the North Anna application are equally applicable to the Fermi 3 COL application, the staff undertook the following reviews:

- The staff compared the North Anna COL FSAR, Revision 1, to the Fermi 3 COL FSAR. In performing this comparison, the staff considered changes made to the Fermi 3 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the North Anna SER with open items.
- The staff confirmed that the applicant has endorsed all responses to the RAIs identified in the corresponding standard content (the North Anna SER) evaluation.
- The staff verified that the site-specific differences are not relevant to this section.

The staff has completed the review and finds the evaluation performed for the North Anna standard content to be directly applicable to the Fermi 3 COL application. This SER identifies the standard content material with italicized, double-indented formatting.

The staff reviewed the information in the Fermi 3 COL FSAR as follows:

COL Item

- STD COL 9.2.5-1-A Post Seven Day Makeup to Ultimate Heat Sink (UHS)

The following portion of this technical evaluation section is reproduced from Section 9.2.5 of the North Anna SER (ADAMS Accession No. ML091730520):

- *STD COL 9.2.5-1-H Post 7 Day Makeup to UHS*

The NRC staff reviewed STD COL 9.2.5-1-H related to the makeup water to the UHS included under Section 9.2.5 of the North Anna 3 COL FSAR. As discussed above in the Introduction Section, the UHS consists of both safety-related and non-safety-related SSCs. The staff's evaluation of the UHS for the ESBWR design focuses primarily on assuring that sufficient makeup water is available and can be supplied to the IC/PCC pools, and SPF for long-term cooling after the initial seven days have elapsed following an accident. Acceptability is judged based upon conformance with the regulatory basis referred to above, as applied to the standard plant design and reflected in Tier 2 of the ESBWR DCD, Revision 5, Section 9.2.5.

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

This COL information item is listed in Tier 2 of the ESBWR DCD, Section 9.2.5.1, "COL Information," and specifies that COL applicants need to develop procedures for supplying makeup water to the IC/PCC pools and SFP for 7 days after an accident. During the period from 72 hours up to 7 days following an accident, the FPS is credited for providing post-accident makeup water to the UHS through safety-related FAPCS piping. After 7 days, the applicant can either use offsite makeup sources to replenish the UHS water supply via safety-related FAPCS connections that are located outside the reactor and fuel buildings, or the applicant can use on-site water sources if they are available. The minimum required flow rate that is specified for post-72 hour makeup is 46 m³/hr (200 gpm), and makeup water quality is normally required to meet demineralized water chemistry specifications. However, during accident conditions, makeup water quality that satisfies FPS or SWS chemistry specifications can be used. The post 7-day makeup water source is not required to be safety-related or subject to RTNSS, but should be from sources that are diverse or highly reliable. These considerations are discussed in Tier 2 of the ESBWR DCD, Section 9.2.5, which specifically states: "The COL applicant will develop procedures to supply makeup water 7 days after an accident (9.2.5-1-H)."

The applicant provided the following response for this COL Item:

"Procedures that identify and prioritize available makeup sources seven days after an accident, and provide instructions for establishing necessary connections, will be developed in accordance with the procedure development milestones in Section 13.5."

*Except for the development milestones that are referred to by the proposed response, it is not clear to what extent the other provisions of Section 13.5, "Plant Procedures," will be implemented, what makeup considerations will be addressed, what criteria will be satisfied, and how soon after an accident the makeup capability will be assessed. Therefore, the staff asked the applicant in **RAI 9.2.5-01** to provide additional information to address these considerations. In a response dated August 4, 2008, the applicant described likely details associated with UHS makeup procedure development. For "STD COL 9.2.5-1-H", the applicant has committed to develop procedures to identify and prioritize available makeup sources for 7 days after an accident. In addition, the applicant made reference to Section 13.5.2.1.4, "Emergency Operating Procedures," and identified that this procedure, "STD COL 9.2.5-1-H", will be developed through the implementation of these processes. The staff determined that this approach is acceptable since the applicant committed to develop this procedure and develop the details to address available means of makeup delivery which includes permanent plant systems, portable equipment and temporary delivery/processing systems in NAPS FSAR Section 9.2.5. Based on the RAI response, the statement in FSAR Section 9.2.5, and the schedule defined in FSAR Section 13.5, the staff determined this issue can be closed.*

In Revision 6 of the DCD, COL STD COL 9.2.5-1-H was renamed STD COL 9.2.5-1-A. The applicant has addressed this COL information item in the same manner documented in the North Anna COL application. In addition, the applicant has identified Commitment COM 9.2-001 to track the development of makeup source procedures in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated COL Item STD COL 9.2.5-1-A using the relevant NRC regulations and

acceptance criteria in Section 9.2.5 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.2.5-1-A.

9.2.5.5 *Post Combined License Activities*

The applicant has proposed the following commitment in this section:

- Commitment (COM 9.2-001) – Procedures that identify and prioritize available makeup sources seven days after an accident, and provide instructions for establishing necessary connections, will be developed in accordance with the procedure development milestone in Section 13.5.

9.2.5.6 *Conclusion*

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the UHS, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the UHS that were incorporated by reference are resolved.

In addition, the staff compared the additional supplemental information in the application to the relevant NRC regulations, the guidance in Section 9.2.5 of NUREG-0800, and other NRC regulatory guides. The staff's review concludes that the applicant's information is acceptable and meets the requirements of GDC 2, 4, 5, 44, 45, and 46, and the guidance in RG 1.206. Therefore, the staff finds that the applicant has satisfactorily addressed DCD COL Item 9.2.5-1-A.

9.2.6 *Condensate Storage and Transfer System*

9.2.6.1 *Introduction*

This FSAR section describes the condensate storage and transfer system (CS&TS) which supplies condensate-quality water for makeup to selected plant systems. This system consists of two independent and 100 percent redundant transfer pumps, which take suction from a single condensate storage tank (CST) and provide water to interface systems as required. The CST serves as a reservoir for the CS&TS water inventory and is the normal source of water for makeup to selected plant systems. This system also provides storage capacity for condensate rejected from the condensate and feedwater system (CFS), for the condensate quality liquid waste management system (LWMS) effluent during normal operation, and for CFS and hotwell inventory during system maintenance outages. The CS&TS is not a safety-related system, and does not perform any safety-related function.

9.2.6.2 *Summary of Application*

Section 9.2.6 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.2.6 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Section 9.2.6, the applicant provides the following:

Supplemental Information

- STD SUP 9.2.6-1 System Description

The applicant provided supplemental information regarding freeze protection provided for the CS&TS.

9.2.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the CS&TS and the associated acceptance criteria are in Section 9.2.6 of NUREG-0800.

NUREG-0800, Section 9.2.6 states that “The safety-related portions of the CSF are protected from the effects of natural phenomena – including cold weather, tornadoes, and flooding – such that the event will not adversely affect the safety function of the system.”

Since the CS&TS is not a safety-related system, and does not perform any safety-related functions, there is no applicable regulatory requirement for the freeze protection for the CS&TS.

9.2.6.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.2.6 of the certified ESBWR DCD. The staff reviewed Section 9.2.6 of the Fermi 3 COL FSAR and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff’s review confirms that the information in the application and the information incorporated by reference address the required information related to the CS&TS.

Section 1.2.3 of this SER discusses the NRC’s strategy for performing one technical review for each standard issue outside the scope of the DC and to use this review to evaluate subsequent COL applications. To ensure that the staff’s findings on standard content that were documented in the SER with open items issued for the North Anna application are equally applicable to the Fermi 3 COL application, the staff undertook the following reviews:

- The staff compared the North Anna COL FSAR, Revision 1, to the Fermi 3 COL FSAR. In performing this comparison, the staff considered changes made to the Fermi 3 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the North Anna SER with open items.
- The staff confirmed that the applicant has endorsed all responses to RAIs identified in the corresponding standard content (the North Anna SER) evaluation.
- The staff verified that the site-specific differences are not relevant to this section.

¹ See “Finality of Referenced NRC Approvals” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

The staff has completed the review and finds the evaluation performed for the North Anna standard content to be directly applicable to the Fermi 3 COL application. This SER identifies the standard content material with of italicized, double-indented formatting.

The staff reviewed the information in the COL FSAR as follows:

Supplemental Information

- STD SUP 9.2.6-1 System Description

The following portion of this technical evaluation section is reproduced from Section 9.2.6 of the North Anna SER (ADAMS Accession No. ML091730520):

- *STD SUP 9.2.6-1 System Description*

The NRC staff reviewed STD SUP 9.2.6-1 related to the freeze protection for the CS&TS included under Section 9.2.6 of the North Anna 3 COL FSAR. The staff reviewed conformance of Section 9.2.6 of the North Anna COL FSAR to the relevant NRC regulations and acceptance criteria defined in NUREG-0800, Section 9.2.6, "Condensate Storage Facilities." The staff's review finds that the applicant appropriately incorporated by reference Section 9.2 of the ESBWR DCD, Revision 5, with the following Tier 2 supplemental information added:

The applicant provided supplemental information as part of the FSAR with regards to CS&TS freeze protection. In FSAR Section 9.2.6, the applicant added the following text to the end of the first paragraph of Section 9.2.6.2 of the ESBWR DCD, Revision 5: "Freeze protection is provided for the CS&TS."

The NRC staff reviewed the standard supplemental information provided in STD SUP 9.2.6-1. Freeze protection for the CS&TS is addressed in Tier 2, Section 1.2.2.12.2, "Condensate Storage and Transfer System," of the ESBWR DCD, Revision 5. Although the CS&TS does not perform or ensure any safety-related function, and is not required to achieve or maintain safe shutdown, DCD Tier 2, Section 1.2.2.12.2 specifies that if required, the CS&TS will be provided with freeze protection. A general discussion on freeze protection is provided in FSAR Section 1.2.2.12.16, "Freeze Protection." The incorporation of freeze protection in the CS&TS design is a system enhancement that has no impact on the system's regulatory compliance, but could result in increase system reliability and availability; therefore the staff finds the proposed standard supplement acceptable.

The staff finds that the applicant's supplemental information provided in STD SUP 9.2.6-1 addresses the intent of DCD Tier 2, Section 1.2.2.12.2 with regard to incorporating freeze protection for the CS&TS.

9.2.6.5 Post Combined License Activities

There are no post COL activities related to this section.

9.2.6.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the CS&TS, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the CS&TS that were incorporated by reference are resolved.

In addition, the staff compared the additional supplemental information in the application to the relevant NRC regulations, the guidance in Section 9.2.6 of NUREG–0800, and other NRC regulatory guides. The staff's review concludes that the applicant's information provided in Supplemental Information STD SUP 9.2.6-1 is acceptable. The staff bases its conclusion on the fact that freeze protection in the CS&TS design is a system enhancement that has no impact on the system's regulatory compliance.

9.2.7 Chilled Water System

Section 9.2.7 of the Fermi 3 COL FSAR incorporates by reference, Section 9.2.7, "Chilled Water System," of the ESBWR DCD, Revision 10 of referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to chilled water system that were incorporated by reference are resolved.

9.2.8 Turbine Component Cooling Water System

Subsection 9.2.8 of the Fermi 3 COL FSAR incorporates by reference Section 9.2.8, "Turbine Component Cooling Water System," of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to TCCWS that were incorporated by reference are resolved.

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

9.2.9 Hot Water System

Subsection 9.2.9 of the Fermi 3 COL FSAR incorporates by reference Section 9.2.9, "Hot Water System," of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to hot water system that were incorporated by reference are resolved.

9.2.10 Station Water System

9.2.10.1 Introduction

This FSAR section COL describes the SWS which provides filtered and treated water as makeup to the circulating water system (CWS) cooling tower basin, the PSWS cooling tower basin, and the primary firewater tanks.

9.2.10.2 Summary of Application

Section 9.2.10 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.2.10 of the certified ESBWR DCD, Revision 10. In addition, in FSAR, Section 9.2.10, the applicant provides the following:

Site Specific Information Replacing Conceptual Design Information

- EF3 CDI Detailed System Description

The applicant provided additional site specific information to replace CDI contained in the ESBWR DCD and described the SWS. The SWS is comprised of two subsystems: (1) the plant cooling tower makeup subsystem (PCTMS) which provides makeup to the plant service water cooling towers and the main CWS cooling tower and (2) the pretreated water supply subsystem (PWSS) which is used for filling the primary firewater tanks. The applicant provided Tables 9.2-204, "Station Water System – Plant Cooling Tower Makeup System Component Design Parameters," and 9.2-205, "Station Water System – Pretreated Water Supply System Component Design Parameters, which list the design parameters of the SWS equipment. The applicant provided Figures 9.2-203, "Station Water System – Plant Cooling Tower Makeup System (PCTMS)," and 9.2-204, "Station Water System – Pretreated Water Supply System (PWSS)," which depict the SWS.

9.2.10.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, there is no associated SRP section in NUREG-0800 for the SWS.

The applicable regulatory requirement for the SWS is as follows:

- GDC 2 as it relates to ensuring that failure of the nonsafety-related system or component due to natural phenomena such as earthquakes, tornadoes, hurricanes, and floods should not adversely affect the safety-related SSCs.

9.2.10.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.2.10 of the certified ESBWR DCD. The staff reviewed Section 9.2.10 of the Fermi 3 COL FSAR and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that the information in the application and the information incorporated by reference address the required information related to the SWS.

The staff reviewed the information in the COL FSAR as follows:

Site Specific Information Replacing Conceptual Design Information

- EF3 CDI Detailed System Description

The NRC staff reviewed EF3 CDI related to the ESBWR conceptual design of the SWS and the design parameters for the SWS components included under Section 9.2.10 of the Fermi 3 COL FSAR.

In FSAR Subsection 9.2.10.2, "System Description," the applicant replaced the "Detailed System Description," portion of this section in the reference ESBWR DCD, Revision 10. In FSAR Subsection 9.2.10.2, the applicant provided the site specific detailed description of the SWS design proposed for Fermi 3. The SWS consists of two subsystems, the PCTMS, and the PWSS.

The PCTMS provides makeup water to the cooling tower basins for both the PSWS and the CWS to compensate for losses of inventory from the cooling towers. The PCTMS also supplies makeup water to replace water used for strainer backwashes. The PCTMS consists of a water source, pumps, strainers, connecting piping, valves and instrumentation. The applicant provided a simplified system diagram in FSAR Figure 9.2-203, and component design parameters for the PCTMS in FSAR Table 9.2-204.

The PWSS supplies water to the FPS for filling the primary firewater tanks and provides alternate cooling tower makeup to the PSWS. The PWSS also provides water for the strainers. The PWSS consists of a water source, pumps, strainers, filters, chemical injection equipment, SWST, connecting piping, valves and instrumentation. Furthermore, the applicant provided a simplified system diagram in FSAR Figure 9.2-204, and component design parameters for the PWSS in Table 9.2-205.

The applicant replaced the detailed system description in the referenced ESBWR DCD, Subsection 9.2.10.2, "System Description," with site specific EF3 CDI. The applicant did not

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

identify any departures and/or supplements, except that the applicant included additional information by providing the SWS flow diagrams in FSAR Figure 9.2-203 and 9.2-204, and component design parameters in FSAR Tables 9.2-204 and 9.2-205. In Subsection 9.2.10.3, "Safety Evaluation," of the ESBWR DCD it is stated that the SWS has no safety-related function. The DCD further states that failure of the SWS does not compromise any safety-related system or component, nor does it prevent a safe shutdown of the plant. Furthermore, the Fermi 3 SWS has no interface with any safety-related equipment, and no interconnections exist between the SWS and any potentially radioactive system. The design information in the Fermi 3 COL application does not impact the conclusions in the staff's FSER for the ESBWR DCD (NUREG-1966), and therefore the staff finds the Fermi 3 SWS design acceptable.

Based on the above discussion, the staff finds that the EF3 CDI provided in this subsection related to the site specific conceptual design of the SWS meets the requirements of GDC 2 because SWS is a nonsafety-related system, and failure of the system or its components due to natural phenomena will have no adverse affects on safety-related SSCs.

Site Specific Pre-Operational Tests

In Supplemental Information STD SUP 14.2-1 the applicant provided information in Subsection 14.2.9.1.1, "Station Water System Pre-Operation Test" to address the SWS pre-operational testing. The preoperational testing review is performed under Section 14.2 of this SER.

9.2.10.5 Post Combined License Activities

There are no post COL activities related to this section.

9.2.10.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the SWS, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the SWS that were incorporated by reference are resolved.

In addition, the staff concludes that the site-specific design portion of the Fermi 3 SWS is acceptable and does not change the conclusions in the staff's FSER for the ESBWR DCD, as they relate to GDC 2.

9.3 Process Auxiliaries

9.3.1 Compressed Air Systems

Subsection 9.3.1 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.1, "Compressed Air Systems," of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section

remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to compressed air systems that were incorporated by reference are resolved.

9.3.2 Process Sampling System

9.3.2.1 Introduction

This FSAR section addresses information related to the ESBWR process sampling system (PSS). The PSS is designed to collect representative water and gaseous samples for analysis from the reactor coolant system and associated auxiliary system process streams during all normal modes of operation and following an accident. The proposed design includes permanently installed sample lines, sampling panels with analyzers and associated sampling equipment, provisions for local grab sampling, and permanent shielding. Provisions are made to ensure that representative samples are obtained from turbulent flow zones to ensure adequate mixing. Continuous sample flows are routed from selected locations to the sampling stations where pressure, temperature, and flow adjustments are made as necessary. Effluents from sample stations are returned to an appropriate process stream or to the radwaste drain headers through a common return line.

9.3.2.2 Summary of Application

Section 9.3.2 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.3.2 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Section 9.3.2, the applicant provides the following:

COL Item

- STD COL 9.3.2-1-A Post Accident Sampling Program

The applicant provided additional information in STD COL 9.3.2-1-A to address DCD COL Item 9.3.2-1-A. The applicant described the post-accident sampling (PAS) program which consists of emergency operating procedures that rely on installed post-accident radiation monitoring instrumentation, plant procedures for obtaining highly radioactive grab samples, a containment monitoring system capable of operation in post loss-of-coolant accident (LOCA) mode, and effluent radiation monitoring. The PAS program functions in lieu of a dedicated post-accident sampling system (PASS).

9.3.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the PSS and the associated acceptance criteria are in Section 9.3.2 of NUREG-0800.

The applicable regulatory requirements for the PAS program are as follows:

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

- *STD COL 9.3.2-1-A Post Accident Sampling Program*

The NRC staff reviewed STD COL 9.3.2-1-A related to the post accident sampling program included under Section 9.3.2 of the North Anna 3 COL FSAR. The staff reviewed conformance of Section 9.3.2 of the North Anna 3 COL FSAR to the guidance in RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.2, "Process and Post-Accident Sampling Systems." The staff's review of the North Anna 3 COL FSAR, Section 9.3.2 finds that it appropriately incorporates by reference Section 9.3.2 of the ESBWR DCD, Revision 5. In addition the applicant provided information on the North Anna 3 post-accident sampling program as required by STD COL 9.3.2-1-A of the ESBWR DCD. The post-accident sampling program meets the guidance provided in SRP Section 9.3.2.1.6 for actions required in lieu of a Post Accident Sampling System (PASS) as follows:

Emergency Operating Procedures that rely on Emergency Action Levels, defined in the Emergency Plan (EP), are used to classify fuel damage events. These procedures rely on installed post-accident radiation monitoring instrumentation described in DCD Section 7.5 and do not require the capability to obtain and analyze highly radioactive coolant samples although sample analyses may be used for classification as well.

Plant procedures contain instructions for obtaining highly radioactive grab samples from the following:

- Reactor Coolant – from the reactor water cleanup/shutdown cooling sample line using the RB Sample Station. These samples can be analyzed for the parameters indicated in DCD Table 9.3-1. If coolant activity is greater than 1.0 Ci/ml, handling of the samples is delayed to avoid overexposure of personnel.*
- Suppression Pool – from FAPCS sample line at the RB Sample Station. These samples can be analyzed for the parameters indicated in DCD Table 9.3-1. If coolant activity is greater than 1.0 Ci/ml, handling of the samples is delayed to avoid overexposure of personnel.*
- Containment Atmosphere - may be taken as described in DCD Section 11.5.3.2.12 and analyzed for fission products.*

DCD Section 7.5.2.2 describes Containment Monitoring System operation in post-LOCA mode for gaseous sampling for O2 and H2.

Effluent radiation monitoring is described in DCD Section 7.5. Field sampling and monitoring capability is maintained in accordance with the EP.

Post accident monitoring is adequate to implement the EP without reliance on post accident sampling capability; therefore, the absence of a dedicated Post-Accident Sampling System does not reduce the effectiveness of the EP.

As part of the review of FSAR, Revision, 0, Section 11.5, the staff noted that FSAR Subsection 9.3.2.2 (System Description) refers incorrectly to Section 11.5.3.2.12 of the ESBWR DCD (Tier 2) regarding available provisions for sampling the containment atmosphere. This subsection of the ESBWR DCD addresses the radiation monitoring system for the technical support center (TSC) air intake and not the containment.

Accordingly, the applicant was requested, under RAI 9.03.02-1, to update the reference citation in FSAR Section 9.3.2.2 with the proper DCD Tier 2, Chapter 11.5 subsection addressing provisions for the sampling of containment atmosphere. In response to RAI 09.03.02-1, the applicant proposed a revision to the section of the FSAR by correcting the improper reference. The staff finds that the applicant has revised their FSAR accordingly and RAI 09.03.02-1 is resolved.

The staff finds that the North Anna 3 COL FSAR has adequately addressed STD COL 9.3.2-1-A by providing information that adequately describes the North Anna Unit 3 post-accident sampling program capability.

The staff evaluated COL Item STD COL 9.3.2-1-A using the relevant NRC regulations and acceptance criteria in Section 9.3.2 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.3.2-1-A with respect to the requirements of GDC 64, 10 CFR 20.1101(b) and Section IV.B of Appendix E to 10 CFR Part 50.

9.3.2.5 Post Combined License Activities

There are no post COL activities related to this section.

9.3.2.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the PSS, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the PSS, that were incorporated by reference are resolved.

In addition, the staff compared the additional supplemental information in the application to the relevant NRC regulations, the guidance in Section 9.3.2 of NUREG-0800, and other NRC regulatory guides. The staff's review concludes that the applicant's information presented in this section of the FSAR is acceptable and meets the requirements of GDC 64, 10 CFR 20.1101(b), and Section IV.B of Appendix E to 10 CFR Part 50. Therefore, staff finds that the applicant has satisfactorily addressed DCD COL Item 9.3.2-1-A.

9.3.3 Equipment and Floor Drain System

Section 9.3.3 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.3, "Equipment and Floor Drain System," of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to equipment and floor drain system that were incorporated by reference are resolved.

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

9.3.4 Chemical and Volume Control System

Section 9.3.4 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.4, “Chemical and Volume Control System,” of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff’s review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to chemical and volume control system that were incorporated by reference are resolved.

9.3.5 Standby Liquid Control System

9.3.5.1 Introduction

This FSAR section addresses the standby liquid control system (SLCS) which is an independent reactivity control system designed to provide both manual and automatically initiated capability for bringing the reactor from full power and minimum control rod inventory to a subcritical condition with the reactor in the most reactive state without taking credit for control rod movement. The SLCS performs safety-related functions; therefore, it is classified as safety-related and is designed as a Seismic Category I system. The SLCS meets the following safety design bases by providing: (1) a diverse backup capability, independent of normal reactor shutdown methods, to shutdown the reactor when the control rods fail to insert during AOOs and anticipated transients without scram (ATWS), and (2) makeup water to the reactor pressure vessel (RPV) to mitigate the consequences of a LOCA.

The SLCS is a passive system which consists of two identical and separate trains. Each SLCS train includes a nitrogen pressurized accumulator containing sodium pentaborate solution and is connected by piping through two parallel injection squib valves to the RPV. Each SLCS provides 50 percent of the required SLCS injection capacity required for an ATWS event.

9.3.5.2 Summary of Application

Section 9.3.5 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.3.5 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Section 9.3.5, the applicant provides the following:

Supplemental Information

- STD SUP 9.3.5-1 System Description

The applicant provided the following supplemental information:

In Supplemental Information STD SUP 9.3.5-1, the applicant added the following to the end of the fifth paragraph under “Detailed System Description” of DCD Section 9.3.5.2, “System Description”:

“The above provisions adequately prevent loss of solubility of borated solutions (sodium pentaborate).”

9.3.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the SLCS and the associated acceptance criteria are in Section 9.3.5 of NUREG-0800.

The applicable regulatory requirements for the SLCS thermal environmental conditions are as follows:

- GDC 2, 4 and 5
- GDC 26, "Reactivity control system redundancy and capability"
- GDC 27, "Combined reactivity control systems capability"
- Item (c)(4) of 10 CFR 50.62(c)(4), "Requirements for reduction or risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants"
- 10 CFR 52.80(a)

9.3.5.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.3.5 of the certified ESBWR DCD. The staff reviewed Section 9.3.5 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that the information in the application and the information incorporated by reference address the required information related to the SLCS.

Section 1.2.3 of this SER discusses the NRC's strategy for performing one technical review for each standard issue outside the scope of the DC and to use this review to evaluate subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER with open items issued for the North Anna application are equally applicable to the Fermi 3 COL application, the staff undertook the following reviews:

- The staff compared the North Anna COL FSAR, Revision 1, to the Fermi 3 COL FSAR. In performing this comparison, the staff considered changes made to the Fermi 3 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the North Anna SER with open items.
- The staff confirmed that the applicant has endorsed all responses to the RAIs identified in the corresponding standard content (the North Anna SER) evaluation were endorsed.
- The staff verified that the site-specific differences are not relevant to this section.

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

The staff completed the review and finds the evaluation performed for the North Anna standard content to be directly applicable to the Fermi 3 COL application. This SER identifies the standard content material with of italicized, double-indented formatting.

The staff reviewed the information in the COL FSAR as follows:

Supplemental Information

- STD SUP 9.3.5-1 System Description

The following portion of this technical evaluation section is reproduced from Section 9.3.5 of the North Anna SER (ADAMS Accession No. ML091730520):

- *STD SUP 9.3.5-1 System Description*

The NRC staff reviewed STD SUP 9.3.5-1-A related to the SLCS included under Section 9.3.5 of the North Anna 3 COL FSAR. The NRC staff reviewed conformance of Section 9.3.5 of the COL FSAR to the guidance in RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.5, "Standby Liquid Control System (BWRs)." The staff's review of Section 9.3.5 of the COL FSAR finds that it appropriately incorporates by reference Section 9.3.5 of the ESBWR DCD, Revision 5.

The staff review of this application is limited to the following item: STD SUP 9.3.5-1 in which the applicant summarized that the provisions adequately prevent loss of solubility of borated solutions (sodium pentaborate).

The NRC staff reviewed the resolution to the supplementary item related to the provisions to prevent loss of solubility of borated solutions (sodium pentaborate) included under Section 9.3.5.2 of the North Anna 3 COL FSAR. STD SUP 9.3.5-1, supplemental information item, is an editorial change which enlightens and summarizes the technical information of the previous paragraphs in the DCD with respect to preventing the loss of solubility of borated solutions of the SLCS. The statement does not alter the technical information related to preventing loss of solubility of borated solutions and hence is acceptable.

The staff evaluated COL Item STD SUP 9.3.5-1 using the relevant NRC regulations and acceptance criteria in Section 9.3.5 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed the requirements of GDC 2, 4, 5, 26, 27, 10 CFR 50.62(c)(4), and 10 CFR 52.80(a).

9.3.5.5 Post Combined License Activities

There are no post COL activities related to this section.

9.3.5.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the SLCS, and no

outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the SLCS, that were incorporated by reference are resolved.

In addition, the staff compared the supplemental information in the COL application to the relevant NRC regulations, the guidance in Section 9.3.5 of NUREG-0800, and other NRC regulatory guides. The staff's review concludes that applicant's information in this section of the COL FSAR is acceptable and meets the requirements of GDC 2, 4, 5, 26, 27, 10 CFR 50.62(c)(4), and 10 CFR 52.80(a). The staff has evaluated STD SUP 9.3.5-1 to the relevant NRC regulations and acceptance criteria in Section 9.3.5 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed the necessary requirements.

9.3.6 Instrument Air System

Subsection 9.3.6 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.6, "Instrument Air System," of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to instrument air system that were incorporated by reference are resolved.

9.3.7 Service Air System

Subsection 9.3.7 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.7, "Service Air System," of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to service air system that were incorporated by reference are resolved.

9.3.8 High Pressure Nitrogen Supply System

Subsection 9.3.8 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.8, "High Pressure Nitrogen Supply System," of the certified ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to high pressure nitrogen supply system that were incorporated by reference are resolved.

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

9.3.9 Hydrogen Water Chemistry System

9.3.9.1 Introduction

This FSAR section describes the hydrogen water chemistry (HWC) system (HWCS) which injects hydrogen into the feedwater system at the suction of the feedwater pumps to reduce oxidizing species in the reactor coolant system. The addition of hydrogen reduces the likelihood of corrosion failures that would adversely affect plant availability. Oxygen is injected into the offgas system to ensure a proper mixture of hydrogen and oxygen.

ESBWR DCD, Section 9.3.9 addresses information related to the ESBWR HWCS. The ESBWR standard plant design includes the capability to incorporate a HWCS.

9.3.9.2 Summary of Application

Subsection 9.3.9 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Subsection 9.3.9 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Subsection 9.3.9, the applicant provides the following:

COL Items

- STD COL 9.3.9-1-A Implementation of Hydrogen Water Chemistry

The applicant provided additional information in STD COL 9.3.9-1-A to address DCD COL Item 9.3.9-1-A. The applicant stated that the HWC option is included in the plant's design.

- EF3 COL 9.3.9-2-A Hydrogen and Oxygen Storage and Supply

The applicant provided additional information in EF3 COL 9.3.9-2-A to address DCD COL Item 9.3.9-2-A. The applicant stated that the hydrogen supply system for the HWCS will meet the requirements of ASME Code, Section VIII, "Rules for Construction of Pressure Vessels," Division 1: Electric Power Research Institute (EPRI) Report NP-4947-SR, "BWR Hydrogen Water Chemistry Guidelines" and EPRI Report NP-4947-SR and EPRI Report NP-5289-SR-A, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations".

Site Specific Information Replacing Conceptual Design Information

- EF3 CDI System Description

The applicant provided additional information to replace CDI in the ESBWR DCD. The applicant described the HWC injection points and states that a monitoring system is provided to track the effectiveness of the HWCS.

- EF3 CDI Hydrogen Storage Facility

The applicant provided additional information to replace CDI in the ESBWR DCD. The applicant provided a description of the hydrogen storage facility. The hydrogen is stored in an 68.13-m³ (18,000 gallon) ASME Section VIII, Division 1 cryogenic tank located outside the plant protected area.

- STD CDI Power Generation Design Basis

The applicant provided additional information to replace CDI in the ESBWR DCD. The applicant stated that hydrogen is injected into the feedwater at the suction of the feedwater pumps and oxygen is injected into the off-gas system.

- STD CDI Inspection and Testing Requirements

The applicant provided additional information to replace CDI in the ESBWR DCD. The applicant stated that the connections for the HWCS are tested and inspected with the feedwater and off-gas piping. Major components of the HWCS are inspected and tested as separate components prior to installation.

- STD CDI Instrumentation and Controls

The applicant provided additional information to replace CDI in the ESBWR DCD. The applicant stated that instrumentation is provided to control the injection of hydrogen and to augment the injection of oxygen.

9.3.9.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, there is no associated SRP section in NUREG-0800 for the HWCS. However, the staff uses the following applicable industry standards and requirements for the HWCS:

- EPRI Report NP-4947-SR, 1987 Revision
- EPRI Report NP-5283-SR-A, 1987 Revision

9.3.9.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.3.9 of the certified ESBWR DCD. The staff reviewed Section 9.3.9 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that the information in the application and the information incorporated by reference address the required information related to the HWCS.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER with open items issued for the North Anna application are equally applicable to the Fermi 3 COL application, the staff undertook the following reviews:

- The staff compared the North Anna COL FSAR, Revision 1, to the Fermi 3 COL FSAR. In performing this comparison, the staff considered changes made to the Fermi 3 COL

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the North Anna SER with open items.

- The staff confirmed that the applicant has endorsed all responses to the RAIs identified in the corresponding standard content (the North Anna SER) evaluation were endorsed.
- The staff verified that the site-specific differences are not relevant to this section.

The staff has completed the review and finds the evaluation performed for the North Anna standard content to be directly applicable to the Fermi 3 COL application. This SER identifies the standard content material with italicized, double-indented formatting.

The staff reviewed the information in the COL FSAR as follows:

COL Items

The following portion of this technical evaluation section is reproduced from Section 9.3.5 of the North Anna SER (ADAMS Accession No. ML091730520):

- *STD COL 9.3.9-1-A Implementation of Hydrogen Water Chemistry*

The HWCS is composed of hydrogen and oxygen supply systems to inject hydrogen in the feedwater and oxygen in the off-gas while several monitoring systems track the effectiveness of the HWCS. Provisions are made in the design to allow for installation of a system adding hydrogen to the feedwater at the suction of the feedwater pumps. The ESBWR DCD requires that the HWCS utilizes the guidance included in the Electric Power Research Institute (EPRI) Report NP-4947-SR, "BWR Hydrogen Water Chemistry Guidelines," 1987 Revision. The report provides guidelines on how to operate the HWCS. The NRC staff has endorsed the report in its SER of the EPRI Utility Requirements Document and on that basis the staff finds Report NP-4947-SR, 1987 Revision acceptable. In addition, the staff finds that the North Anna COL FSAR has adequately addressed STD COL 9.3.2-1-A by providing information that adequately describes the North Anna Unit 3 HWCS and incorporates the EPRI guidance

The staff evaluated COL Item STD COL 9.3.9-1-A using the relevant NRC endorsed EPRI guidelines. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.3.9-1-A.

- EF3 COL 9.3.9-2-A Hydrogen and Oxygen Storage and Supply

The HWCS is nonsafety-related; however, given the potential for hydrogen combustion or detonation, the handling of hydrogen at nuclear power plant facilities needs to be safe, reliable, and consistent with the requirements for using hydrogen gas. The ESBWR DCD requires that any HWCS installations including the means for storing and handling hydrogen meet the EPRI Report NP-5283-SR-A, "Guidelines for Permanent BWR Hydrogen Water Chemistry Installations." The EPRI report provides guidance on an acceptable method to store and handle hydrogen at nuclear power facilities. The staff has approved EPRI Report NP-5283-SR-A in a letter dated July 13, 1987 from J.E. Richardson to G.H. Niels (Legacy ADAMS Accession Nos. 8707230357 and 8707240210). Therefore, the staff finds that the Fermi 3 COL FSAR

specifies an acceptable method to handle and store hydrogen for the HWCS and incorporates the EPRI guidance.

Site Specific Information Replacing Conceptual Design Information

The staff finds that all the EF3 and STD CDIs listed below are acceptable because they do not affect the Staff's safety evaluation of the HWCS in the ESBWR DCD. These site-specific CDIs also do not affect the COL applicant's incorporation of the EPRI guidelines as the main guidance for the proper operation and installation of the HWCS.

- EF3 CDI System Description

The staff finds the CDI acceptable because it provides a monitoring system to track the effectiveness of the HWCS.

- EF3 CDI Hydrogen Storage Facility

The staff finds that the Fermi 3 COL FSAR specifies an acceptable method to store hydrogen.

- STD CDI Power Generation Design Basis

The staff finds the CDI acceptable because it provides the location where each gas is injected

- STD CDI Inspection and Testing Requirements

The staff finds the CDI acceptable because it ensures the HWCS will work as designed.

- STD CDI Instrumentation and Controls

The staff finds the CDI acceptable because it provides information on the proper functionality of the HWCS.

9.3.9.5 Post Combined License Activities

There are no post COL activities related to this section.

9.3.9.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the HWCS, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the HWCS, that were incorporated by reference are resolved.

In addition, the staff compared the additional COL supplemental information in the application to the relevant NRC regulations, the guidance in applicable industry standards, and other NRC regulatory guides. The staff's review concludes that the applicant's information on STD CDI and EF3 CDI in this FSAR section is acceptable and meets the NRC endorsed EPRI guidelines.

The staff also finds that the applicant has satisfactorily addressed DCD COL Items 9.3.9-1-A and 9.3.9-2-A with respect to the NRC endorsed EPRI guidelines.

9.3.10 Oxygen Injection System

9.3.10.1 Introduction

This FSAR section addresses information related to the ESBWR oxygen injection system (OIS). The OIS does not perform any safety-related function. The OIS is designed to add oxygen to the CFS in order to reduce corrosion and suppress corrosion product release. Industry experience has shown that the most beneficial oxygen concentration is between 30 to 200 parts per billion (ppb). The OIS is also designed to inject oxygen into the off-gas system when the HWCS is implemented, to ensure that excess hydrogen in the off-gas stream is recombined.

9.3.10.2 Summary of Application

Section 9.3.10 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.3.10 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Section 9.3.10, the applicant provides the following:

COL Item

- EF3 COL 9.3.10-1-A Oxygen Storage Facility

The applicant provided additional information in EF3 COL 9.3.10-1-A to address DCD COL Item 9.3.10-1-A. The applicant described the bulk oxygen storage facility which consists of a 34.07-m³ (9,000 gallon) ASME Section VIII, Division 1 cryogenic tank located outside the plant fenced area. The tank is equipped with an atmospheric vaporizer, a pressure regulating valve, an excess flow check valve and relief valves.

9.3.10.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, there is no associated SRP section in NUREG-0800 for the oxygen storage facility. However, the staff uses the following applicable industry standards and requirements for the HWCS:

- EPRI Report NP-4947-SR, 1987 Revision
- EPRI Report NP-5283-SR-A, 1987 Revision

9.3.10.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.3.10 of the certified ESBWR DCD. The staff reviewed Section 9.3.10 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that the

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

information in the application and the information incorporated by reference address the required information related to the OIS.

The staff reviewed the information in the COL FSAR as follows:

COL Item

- EF3 COL 9.3.10-1-A Oxygen Storage Facility

The NRC staff reviewed COL Item EF3 COL 9.3.10-1-A related to the oxygen storage facility included under Section 9.3.10 of the Fermi 3 COL FSAR. The OIS is designed to add sufficient oxygen (30 to 200 ppb) to reduce corrosion, general corrosion, and the release of corrosion products in the CFSs. The requirements for design, operation, maintenance, surveillance, and testing of the oxygen storage facility are specified in EPRI Report NP-5283-SR-A. The ESBWR DCD requires that any HWCS and OIS installations meet the guidance in EPRI Report NP-5283-SR-A. In addition, the oxygen storage facility is located in an area where the amount of combustible material is limited through design and administrative controls. Fermi 3 COL FSAR uses the guidance of EPRI Report NP-5283-SR-A to store and handle oxygen. The staff has approved EPRI Report NP-5283-SR-A in a letter dated July 13, 1987 from J.E. Richardson to G.H. Niels (Legacy ADAMS Nos. 8707230357 and 8707240210). Therefore, the staff finds that the Fermi 3 COL FSAR specifies an acceptable method to handle and store oxygen for the OIS and incorporates the EPRI guidance..

In addition, the staff finds that the Fermi 3 COL FSAR has adequately addressed COL Item EF3 COL 9.3.2-1-A by providing (1) information that adequately describes the Fermi 3 oxygen injection module of the HWCS and (2) an acceptable description of the oxygen storage facility.

9.3.10.5 Post Combined License Activities

There are no post COL activities related to this section.

9.3.10.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the OIS, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the OIS, that were incorporated by reference are resolved.

In addition, the staff compared the additional COL supplemental information in the application to the relevant NRC regulations, the guidance in applicable industry standards, and other NRC regulatory guides. The staff's review concludes that the applicant's information in this FSAR section is acceptable and meets the NRC endorsed EPRI guidelines. The staff also finds that the applicant has satisfactorily addressed DCD COL Item 9.3.10-1-A with respect to the NRC-endorsed EPRI guidelines.

9.3.11 Zinc Injection System

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.3.11 of the certified ESBWR DCD. The staff reviewed Section 9.3.11 "Zinc Injection System" of the Fermi 3

COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹

Section 9.3.11 of the ESBWR DCD states that the ESBWR Standard Plant design includes provisions for connecting an optional Zinc Injection System (ZIS). This section also provides two COL Items, stating that the COL applicant shall determine if a ZIS is required to be implemented at startup based on plant configuration and material selection (COL 9.3.11-1-S), and if a ZIS were to be installed the applicant shall include necessary information on system description, test and inspection (COL 9.3.11-2-A). In FSAR Section 9.3.11 of the Fermi 3 COL FSAR the applicant stated that for both COL Items (STD COL 9.3.11-1-A and STD COL 9.3.11-2-A) a ZIS will not be utilized. The NRC staff's review confirms that the applicant has addressed the relevant information and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. From a dose reduction perspective of the ZIS, in Section 12.3 of this SER, the staff provides an evaluation of the applicant's justification for not using ZIS.

The staff's review confirms that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this subsection. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," Appendix E, Section VI.B.1, all nuclear safety issues relating to ZIS that were incorporated by reference are resolved.

9.3.12 Auxiliary Boiler System

Subsection 9.3.12 of the Fermi 3 COL FSAR incorporates by reference Section 9.3.12, "Auxiliary Boiler System," of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to auxiliary boiler system that were incorporated by reference are resolved.

9.4 Heating, Ventilation, and Air Conditioning

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.4 of the certified ESBWR DCD. The staff reviewed Section 9.4 "Heating, Ventilation, and Air Conditioning" of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹

In Fermi 3 COL Revision 3, the applicant identified Departure DEP 11.4-1 as having a Tier 2 impact on the information contained in this section. In addition, in Part 7 of the Fermi 3 COL application, Revision 3, the applicant classified the above departure as a Tier 1 Departure. In a letter dated August 24, 2011 (ADAMS Accession No. ML11238A049), the applicant re-classified this departure as a Tier 2 departure that does not require prior NRC approval in accordance with

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

10 CFR Part 52, Appendix E, Section VIII.B.5. In addition, the applicant revised Section 9.4 of the Fermi 3 FSAR to fully incorporate by reference Section 9.4 of the DCD with no departures or supplements. This item was tracked as Confirmatory Item 9.4-1. The staff has confirmed that these changes have been incorporated into the Fermi 3 COL FSAR. Therefore, Confirmatory Item 9.4-1 is closed.

The staff's review confirms that the applicant has addressed the required information, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the heating, ventilation, and air conditioning (HVAC) that were incorporated by reference are resolved.

9.5 Other Auxiliary Systems

9.5.1 Fire Protection System

9.5.1.1 Introduction

This FSAR section describes the FPS which provides assurance, through a defense-in-depth philosophy, that the Commission's fire protection objectives are satisfied. These objectives are: (1) to prevent fires from starting; (2) to detect rapidly, control, and extinguish promptly those fires that do occur; and (3) to provide protection for SSCs important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant. In addition, the FPS must be designed such that a failure or inadvertent operation does not adversely impact the ability of the SSCs important to safety to perform their safety functions. The FPS has a RTNSS function to provide post 72 hour makeup to the IC/PCC pools and the SFP.

9.5.1.2 Summary of Application

Section 9.5.1, Appendices 9A, and 9B of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.5.1, Appendices 9A and 9B of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COL FSAR Section 9.5.1 and Appendix A the applicant provides the following:

Tier 2 Departure Not Requiring NRC Approval

EF3 DEP 11.4-1

Long-Term, Temporary Storage of Class B and C
Low-Level Radioactive Waste

In Part 7 of the Fermi 3 COL application, Revision 3, the applicant classified Departure EF3 DEP 11.4-1 as a Tier 1 departure. In letter dated August 24, 2011 (ADAMS Accession No. ML11238A049), the applicant re-classified this Departure as a Tier 2 Departure that does not require prior NRC approval in accordance with 10 CFR Part 52, Appendix E, Section VIII.B.5.

The applicant summarizes this departure as follows:

The ESBWR DCD identifies that on-site storage space for a six-month volume of packaged waste is provided in the Radwaste Building (RWB). The Fermi 3 Radwaste Building is configured to accommodate a minimum of ten years volume of packaged Class B and C waste, while maintaining space for at least three months of packaged

Class A waste. This departure is affected by reconfiguring the arrangement of systems and components within the ESBWR RWB volume. The systems structures and components requiring re-arrangement are associated with the LWMS and Solid Waste Management System (SWMS). The existing Radwaste Building Fire Protection and HVAC Systems have sufficient capacity to accommodate the extra volume of Class B and C wastes, and require no modification.

COL Items

- EF3 COL 9.5.1-1-A Secondary Firewater Storage Source

The applicant provided additional information in COL Item EF3 COL 9.5.1-1-A to address DCD COL Item 9.5.1-1-A. The applicant identified Lake Erie as the secondary source of water. The lake has a capacity well in excess of 2,082 m³ (550,000 gallons) as specified in ESBWR DCD, Revision 10, and as per guidance given in RG 1.189, "Fire Protection for Nuclear Power Plants," Regulatory Position 3.2.1.

- EF3 COL 9.5.1-2-A Secondary Firewater Capacity

The applicant provided additional information in EF3 COL 9.5.1-2-A to address DCD COL Item 9.5.1-2-A. The applicant stated that tests will be performed to demonstrate that the secondary fire protection pump circuit supplies the required flow and pressure at the turbine building/yard interface boundary. DCD Subsection 14.2.8.1.39 which is incorporated by reference states that FPS tests are in accordance with the criteria in codes and standards listed in Table 9.5-1. Therefore, secondary pump curve tests and flow test will be in accordance with National Fire Protection Association (NFPA) 20, "Standard for the Installation of Stationary Pumps for Fire Protection."

- EF3 COL 9.5.1-4-A Piping and Instrumentation Diagrams

The applicant provided additional information in EF3 COL 9.5.1-4-A to address DCD COL Item 9.5.1-4-A. The applicant provided Figure 9.5-201, and DCD Figure 9.5-1 depicting the site-specific firewater supply piping.

- STD COL 9.5.1-5-A Fire Barriers

The applicant provided additional information in STD COL 9.5.1-5-A to address DCD COL Item 9.5.1-5-A. The applicant stated that the mechanical and electrical penetration seals and electrical raceway fire barrier systems are qualified to the requirements in RG 1.189 through testing by a recognized laboratory in accordance with the applicable guidance of NFPA 251, "Standard Methods of Test of Fire Resistance of Building Construction and Materials," and/or ASTM E-119, "Standard Test Methods for Fire Tests of Building Construction and Materials". Certification test results will be available for review at least six months prior to receipt of fuel.

- STD COL 9.5.1-6-A Smoke Control

The applicant provided additional information in STD COL 9.5.1-6-A to address DCD COL Item 9.5.1-6-A. The applicant stated that the procedures for manual smoke control will be developed as part of the Fire Protection Program implementation. The program will be operational for areas storing new fuel and adjacent fire areas that could affect the fuel storage

area prior to receipt of the fuel. Other required elements of the Fire Protection Program will be operational prior to initial fuel load.

- STD COL 9.5.1-7-A Fire Hazards Analysis (FHA) Compliance Review

The applicant provided additional information in STD COL 9.5.1-7-A to address DCD COL Item 9.5.1-7-A. The applicant stated that the compliance review of the as-built design against the assumptions and requirements stated in the fire hazards analysis (FHA) will be completed prior to fuel load.

- STD COL 9.5.1-8-A Fire Protection Program Description

The applicant provided additional information in STD COL 9.5.1-8-A to address DCD COL Item 9.5.1-8-A. The applicant stated that the fire protection program will be operational for areas storing new fuel and adjacent fire areas that could affect the fuel storage area prior to receipt of the fuel. Other required elements of the fire protection program will be operational prior to initial fuel load per FSAR Section 13.4.

- EF3 COL 9.5.1-10-A Fire Brigade

The applicant provided additional information in EF3 COL 9.5.1-10-A to address DCD COL Item 9.5.1-10-A. The applicant stated that the fire brigade will be implemented in accordance with the milestones in FSAR Section 13.4 for the Fire Protection Program.

- STD COL 9.5.1-11-A Quality Assurance

The applicant provided additional information in STD COL 9.5.1-11-A to address DCD COL Item 9.5.1-11-A. The applicant stated the following:

“Quality assurance controls are applied to the activities involved in the design, procurement, installation, and testing and the administrative controls of FPS, in accordance with the measures outlined in Chapter 17.

For the operational fire protection program, the Quality Assurance Program implements the requirements of RG 1.189 through site-specific administrative controls procedures. The procedures will be developed six months before fuel receipt and will be fully implemented prior to fuel receipt.”

- EF3 COL 9A.7-1-A Yard Fire Zone Drawings

The applicant provided additional information in EF3 COL 9A.7-1-A to address DCD COL Item 9A.7-1-A. EF3 COL 9A.7-1-A provides fire zone drawings for the site-specific portions of the Yard.

- EF3 COL 9A.7-2-A Detailed Fire Hazards Analysis of the Yard

The applicant provided additional information in EF3 COL 9A.7-2-A to address DCD COL Item 9A.7-2-A. The applicant commits (COM 9A-001) to performing a detailed FHA of the yard area, service building, and service water treatment building that is outside the scope of the certified design. This information will be provided six months prior to fuel load.

Supplemental Information

- EF3 SUP 9.5.1-1 and EF3 SUP 9A-01 Codes, Standards and Regulatory Guidance

The applicant provided Table 9.5-201 to supplement DCD Table 9.5-1 for those portions of the Fire Protection Program that are not addressed in the ESBWR DCD and for operational aspects of the fire detection and suppression systems. In addition, the applicant provided Table 1.9-204 which identifies the relevant editions for each applicable code and standard.

- STD SUP 9.5.1-3 Combustible and Ignition Source Controls

The applicant revised FSAR Subsection 9.5.1.15.6 to add combustible and ignition source controls for areas adjacent to the main control room (MCR) and in computer rooms that are not part of the control room complex and to (1) prohibit storage of transient combustibles below the raised floor in the MCR complex and (2) prohibit the storage of hazardous chemicals in areas that contain or expose equipment important to safety.

9.5.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the FPS and the associated acceptance criteria are in Section 9.5.1 of NUREG-0800.

In accordance with Section VIII, "Process for Changes and Departures," of Appendix E to Part 52 "Design Certification Rule for the U.S. Economic Simplified Boiling Water Reactor," the applicant has identified a Tier 2 Departure not requiring NRC approval for this subsection. Tier 2 departures not requiring prior NRC approval are subject to the requirements of 10 CFR Part 52, Appendix E, Section VIII.B.5, which are similar to the requirements in 10 CFR 50.59, "Changes, tests, and experiments."

The applicable regulatory requirements and associated guidance/standards for the Fire Protection Program are as follows:

- 10 CFR Part 50.48, "Fire Protection"
- GDC 3 and 5
- GDC 19, "Control room"
- GDC 23, "Protection system failure modes"
- Item (d) of 10 CFR 52.79(d), "Contents of applications; technical Information in Final Safety analysis Report"

- 10 CFR 52.80(a)
- SECY-90-016, “Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory Requirements”
- SECY-93-087, “Policy, Technical, and Licensing Issues pertaining to Evolutionary and Advanced Light-Water Reactor Designs”
- SECY-94-084, “Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs”
- RG 1.189, Revision 2
- RG 1.206, as it relates to the applicant’s cited commitments in this subsection

9.5.1.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.5.1 of the certified ESBWR DCD. The staff reviewed Section 9.5.1 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff’s review confirms that the information in the application and the information incorporated by reference address the required information related to the FPS.

Section 1.2.3 of this SER discusses the NRC’s strategy for performing one technical review for each standard issue outside the scope of the DC and to use this review in evaluating subsequent COL applications. To ensure that the staff’s findings on standard content that were documented in the SER with open items issued for the North Anna application are equally applicable to the Fermi 3 COL application, the staff undertook the following reviews:

- The staff compared the North Anna COL FSAR, Revision 1, to the Fermi 3 COL FSAR. In performing this comparison, the staff considered changes made to the Fermi 3 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the North Anna SER with open items.
- The staff confirmed that the applicant has endorsed all responses to the RAIs identified in the corresponding standard content (the North Anna SER) evaluation were endorsed.
- The staff verified that the site-specific differences are not relevant to this section.

The staff has completed the review and finds the evaluation performed for the North Anna standard content to be directly applicable to the Fermi 3 COL application. This SER identifies the standard content material with italicized, double-indented formatting.

¹ See “*Finality of Referenced NRC Approvals*” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.

The staff reviewed the relevant information in the COL FSAR:

Tier 2 Departure Not Requiring Prior NRC Approval:

EF3 DEP 11.4-1

Long-Term, Temporary Storage of Class B and C
Low-Level Radioactive Waste

Under Departure EF3 DEP 11.4-1, the applicant has reconfigured specific areas of the RWB to accommodate the long-term storage of Class B and Class C low-level radioactive waste. The reconfiguration involves plant systems and components within specific areas of the ESBWR RWB. The SSCs requiring re-arrangement are associated with the LWMS and SWMS. The applicant stated that the existing RWB fire protection and HVAC systems have sufficient capacity to accommodate the volumes of Class B and C wastes stored in the designated area, and require no modification. For more information regarding the technical discussion of this departure, please see Section 11.4 of this SER.

With respect to the review scope of Subsection 9.5.1, due to Departure EF3 DEP 11.4-1 the applicant has replaced DCD Tier 2, Table 9A.5-5 with FSAR Tier 2, Table 9A.5-5R. In addition, the applicant has replaced DCD Tier 2 Figures 9.A-2-20 through Figure 9.A-2-24 with FSAR Tier 2, Figures 9.A-2-20R through Figure 9.A-2-24R.

The applicant's Part 7 Departures Report evaluation in accordance with 10 CFR Part 52, Appendix E, Section VIII, Item B.5 determined that this departure does not require prior NRC approval. Within the review scope of this section, the staff reviewed the proposed changes specified above and finds it reasonable that the departure does not require prior NRC approval since they should not have any adverse effect on the fire protection system. In addition, the applicant's process for evaluating departures and other changes to the DCD is subject to NRC inspections.

As stated above, in Part 7 of the Fermi 3 COL Revision 3, the applicant classified the above departure as a Tier 1 departure. In a letter dated August 24, 2011 (ADAMS Accession No. ML11238A049), the applicant re-classified this Departure as a Tier 2 departure that does not require prior NRC approval in accordance with 10 CFR Part 52, Appendix E, Section VIII.B.5 as discussed above. This item was tracked as Confirmatory Item 9.5.1-1. The staff has confirmed that these changes have been incorporated into the Fermi 3 COL FSAR. Therefore Confirmatory Item 9.5.1-1 is closed.

COL Items

- EF3 COL 9.5.1-1-A Secondary Firewater Storage Source

The NRC staff reviewed EF3 COL 9.5.1-1-A related to secondary firewater sources included under Section 9.5.1.4 of the Fermi 3 COL FSAR, Revision 7. The staff has determined that the secondary firewater source is Lake Erie, which is well in excess of the 2,082 m³ (550,000 gallons) specified in the ESBWR DCD, Revision 10, and is also in excess of the guidance given in RG 1.189 Regulatory Position 3.2.1 for a secondary firewater source. The staff finds that the Fermi 3 COL FSAR fully addresses this COL Information Item.

- EF3 COL 9.5.1-2-A Secondary Firewater Capacity

The NRC staff reviewed EF3 COL 9.5.1-2-A related to secondary firewater capacity included under Subsection 9.5.1.4 of the Fermi 3 COL FSAR, Revision 7. The staff has determined that each secondary fire pump will be tested to show that each pump can supply a minimum of 484 m³ per hour (m³/hr) (2130 gpm) with sufficient discharge pressure to develop a minimum of 738 kilopascal gage (kPaG) (107 pounds per square inch gage (psig)) at the turbine building/yard interface boundary, which is the level required by the DCD. DCD Subsection 14.2.8.1.39 which is incorporated by reference states that FPS tests are in accordance with the criteria in codes and standards listed in Table 9.5-1. Therefore, secondary pump curve tests and flow test will be in accordance with NFPA 20. However, this testing cannot be performed until the system is built and the applicant has specified that this testing will be completed prior to fuel receipt. The applicant has identified Commitment COM 9.5-001 as a commitment to track the testing of the secondary fire capacity in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated EF3 COL 9.5.1-2-A using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-2-A.

- EF3 COL 9.5.1-4-A Piping and Instrumentation Diagrams

The NRC staff reviewed EF3 COL 9.5.1-4-A related to the site specific simplified piping and instrumentation diagrams included under Section 9.5.1 of the Fermi 3 COL FSAR, Revision 7. The staff reviewed FSAR Figure 9.5.201 of the Fermi 3 COL application and DCD Figure 9.5.1 and has determined that these figures provide simplified diagrams of the site-specific firewater piping as requested by the DCD. The staff finds that Fermi 3 COL FSAR fully addresses this COL Information Item.

- EF3 COL 9.5.1-10-A Fire Brigade

The NRC staff reviewed EF3 COL 9.5.10-1-A related to implementation of the fire brigade included under Subsection 9.5.1.15.4 of the Fermi 3 COL FSAR, Revision 7. The staff has determined that the implementation of the fire brigade will be in accordance with the milestones in Section 13.4 for the Fire Protection Program. The staff accepts Fermi 3's fire brigade implementation milestones as given in Section 13.4 since they will provide appropriate protection consistent with the plant's completion schedule. Additionally, the fire brigade requirements in the DCD are incorporated by reference. The applicant has identified Commitment COM 9.5-006 to track the implementation of the fire brigade in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated EF3 COL 9.5.1-10-A to the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-10-A.

- STD COL 9.5.1-5-A Fire Barriers

The following portion of this technical evaluation section is reproduced from Section 9.5.1 of the North Anna SER (ADAMS Accession No. ML091730520):

- STD COL 9.5.1-5-A Fire Barriers

The NRC staff reviewed NAPS COL 9.5.1-5-A related to the qualification of fire barriers included under Section 9.5.1.10 of the North Anna 3 COL FSAR Revision 1. The staff determined that mechanical and electrical penetration seals and electrical raceway fire barrier systems will be qualified to the requirements delineated in RG 1.189 by a recognized testing laboratory in accordance with the applicable guidance of NFPA 251 and/or American Society for Testing and Materials E-119. Detailed design in this area is not complete. Specific design and certification test results for penetration seal designs and electrical raceway fire barrier systems will be available for review at least six months prior to fuel receipt. The staff finds that North Anna 3 COL FSAR Revision 1 fully addresses this COL Information Item.

The applicant has identified Commitment COM 9.5-002 to track the specific design and certification testing of the fire barriers in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated COL Item STD COL 9.5.1-5-A using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-5-A.

- STD COL 9.5.1-6-A Smoke Control

The following portion of this technical evaluation section is reproduced from Section 9.5.1 of the North Anna SER (ADAMS Accession No. ML091730520):

- STD COL 9.5.1-6-H Smoke Control

The NRC staff reviewed STD COL 9.5.1-6-H related to manual smoke control included under Section 9.5.1.11 of the North Anna 3 COL FSAR Revision 1. The staff determined that procedures for manual smoke control will be developed as part of the Fire Protection Program implementation in accordance with milestones in FSAR Section 13.4. Smoke removal provisions are in accordance with NFPA 804 except Sections 8.4.3 (3) and 8.4.3.2 as per the DCD. NFPA 804 has not been endorsed by the NRC but is considered acceptable where it does not conflict with regulatory requirements and guidance. The applicant's response to RAI 09.05.01-3 states that should a conflict exist between RG 1.189 and NFPA 804 the COL application conforms to RG 1.189. Automatic sprinkler protection is provided where applicable to limit heat and smoke generation as per the DCD.

RAI 09.05.01-16 addresses issues related to smoke control as follows:

Summary:

Describe how the FHA will evaluate the potential for the migration of smoke, hot gases or fire suppressant to prevent safe shutdown and verify that fire dampers that do not close on smoke detection will not be relied upon to prevent the migration of smoke from one redundant train to another.

Resolution:

The applicant's response to RAI 09.05.01-16 stated that FSAR Section 9.5.1 incorporated by reference ESBWR DCD, Section 9.5.1, which describes the ESBWR plant design features that address building ventilation, fire barriers, and smoke control necessary for safe shutdown. As stated in the ESBWR DCD the ESBWR design satisfies the guidance from the NUREG-0800 SRP Section 9.5.1 and BTP SPLB 9.5-1, that smoke, hot gases, or the fire suppressant does not migrate into other fire areas to the extent that safe shutdown capabilities, including operator actions, could be adversely affected. The ESBWR fire protection design satisfies this guidance with a combination of fire dampers and other barriers, smoke evacuation capabilities, and minimal required operator actions. Additionally, manual smoke control procedures will be developed as part of the Fire Protection Program implementation. Smoke-rated dampers that close on smoke detection are provided in areas where smoke migration into other areas can adversely affect safe shutdown. Details are provided in the FHA in Appendix 9A. There are no fire protection-related site-specific design features that are required to ensure safe-shutdown of the plant.

The NRC staff finds that North Anna 3 COL FSAR Revision 1 fully addresses this COL Information Item.

In Revision 6 of the DCD, STD COL 9.5.1-6-H was renamed STD COL 9.5.1-6-A. The applicant has identified Commitment COM 9.5-003 to track the development of manual smoke control procedures in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated COL Item STD COL 9.5.1-6-A to the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-6-A.

- STD COL 9.5.1-7-A Fire Hazards Analysis (FHA) Compliance Review

The following portion of this technical evaluation section is reproduced from Section 9.5.1 of the North Anna SER (ADAMS Accession No. ML091730520):

- *STD COL 9.5.1-7-H* *FHA Compliance Review*

The NRC staff reviewed STD COL 9.5.1-7-H related to review for FHA compliance included under Section 9.5.1.12 of the North Anna 3 COL FSAR Revision 1. The staff determined that a compliance review of the as-built design against the assumptions and requirements stated in the FHA will be completed in accordance with the milestones in FSAR Section 13.4. This is acceptable to the staff. ESBWR DCD, Revision 5 added all the specific items to be reviewed into STD 9.5.1-7-H and deleted STD SUP 9.5.1-2. The staff finds that North Anna 3 COL FSAR Revision 1 fully addresses this COL Information Item.

In Revision 6 of the DCD, STD COL 9.5.1-7-H was renamed STD COL 9.5.1-7-A. The applicant has identified Commitment COM 9.5-004 as a commitment to track FHA compliance review in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated COL Item STD COL 9.5.1-7-A to the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-7-A.

- STD COL 9.5.1-8-A Fire Protection Program Description

The following portion of this technical evaluation section is reproduced from Section 9.5.1 of the North Anna SER (ADAMS Accession No. ML091730520):

- STD COL 9.5.1-8-A Fire Protection Program Description

The NRC staff reviewed STD COL 9.5.1-8-A related to the operational status of the Fire Protection Program included under Section 9.5.1.15 of the North Anna 3 COL FSAR Revision 1. The staff determined that the elements of the Fire Protection Program necessary to support receipt and storage of fuel onsite for buildings storing new fuel and adjacent fire areas that could affect the fuel storage area are fully operational prior to receipt for new fuel. Other required elements of the Fire Protection Program described in this section are fully operational prior to initial fuel loading per Section 13.4. NUREG-0800, Section 9.5.1, Revision 5 states that Fire Protection Program should be fully implemented prior to fuel receipt at the plant site. Additionally, the Fire Protection Program requirements are incorporated by reference to the DCD. The staff accepts North Anna 3's fire protection implementation milestones as given in Section 13.4 since they will provide appropriate protection consistent with the plant's completion schedule. The staff finds that North Anna 3 COL FSAR Revision 1 fully addresses this COL Information Item.

The staff evaluated COL Item STD COL 9.5.1-8-A using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800,. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-8-A.

- STD COL 9.5.1-11-A Quality Assurance

The following portion of this technical evaluation section is reproduced from Section 9.5.1 of the North Anna SER (ADAMS Accession No. ML091730520):

- STD COL 9.5.1-11-A Quality Assurance

The NRC staff reviewed STD COL 9.5.1-11-A related to implementation of the QA program included under Section 9.5.1 of the North Anna 3 COL FSAR Revision 1. The staff determined that the QA controls for activities involved in the design, procurement, installation, and testing and administrative controls of FPS is in accordance with the measures outlined in Chapter 17 and for the operational Fire Protection Program the QA Program implements the requirements of RG 1.189 through site-specific administrative controls procedures. These operational QA procedures will be developed six months prior to fuel receipt and will be fully implemented prior to fuel receipt.

The NRC staff accepts North Anna 3's fire protection QA program milestones since they will provide appropriate protection consistent with the plant's completion schedule and provide sufficient time for NRC review. The staff finds that North Anna 3 COL FSAR Revision 1 fully addresses this COL Information Item.

The applicant has identified Commitment COM 9.5-007 to track the development of quality assurance controls of the FPS in order to address this COL information item in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated COL

Item STD COL 9.5.1-11-A using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.1-11-A.

- EF3 COL 9A.7-1-A Yard Fire Zone Drawings

The NRC staff reviewed EF3 COL 9A.7-1-A related to yard fire zone drawings included under Appendix 9A of the Fermi 3 COL FSAR, Revision 7. The staff reviewed the revised fire zone drawings, Figures 9A.2-33R and 9A.2-201, and determined that the site-specific fire zones have been included as needed. They reflect design evolution changes unrelated to fire protection, and added missing information. The staff finds that the Fermi 3 COL FSAR fully addresses this COL Information Item. The staff evaluated COL Item EF3 COL 9A.7-1-A using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9A.7-1-A.

- EF3 COL 9A.7-2-A Detailed Fire Hazards Analysis of the Yard

The NRC staff reviewed EF3 COL 9A.7-2-A related to Fermi 3 site detailed FHA included under Appendix 9A of the Fermi 3 COL FSAR, Revision 7. The staff reviewed the information in Sections 9A.4.7, 9A.5.7, 9A.5.8, 9A.5.9, and Table 9A.5-7R and determined that the detailed FHA of the plant areas that are outside the scope of the certified design will be completed six months prior to fuel load. The staff accepts Fermi 3's site-specific FHA milestones since they will provide appropriate protection consistent with the plant's completion schedule and provide sufficient time for the NRC to review. The applicant has identified Commitments COM 9A-001, COM 9A-002 and COM 9A-003 as commitments to track the completion of the detailed fire hazard analysis of the yard area in accordance with the guidance set forth in RG 1.206, Regulatory Position C.III.4.3(4). The staff evaluated COL Item EF3 COL 9A.7-2-A using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800, along with the guidance in RG 1.206. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9A.7-2-A.

Supplemental Information Items

- EF3 SUP 9.5.1-1 and EF3 SUP 9A-01 Codes, Standards and Regulatory Guidance

The NRC staff reviewed EF3 SUP 9.5.1-1 and EF3 SUP 9A-01 related to the codes and standards included under Section 9.5.1 and Appendix 9A of the Fermi 3 COL FSAR, Revision 7. The staff has determined that Table 9.5-201 added the codes and standards that are applicable for those portions of the Fire Protection Program outside the scope of the DCD and for the operational aspects of the Fire Protection Program. These added codes and standards are acceptable for Fermi 3 since the NFPA standards listed are referenced in RG 1.189. The Michigan Building Code is a local code that is required to be met by Fermi 3; the Environmental Protection Agency standards are Federal standards that apply to Fermi 3; and the ASME Code Section IX "Welding and Brazing Qualifications," is referenced in SRP Section 6.1.1 "Engineered Safety Features Materials. The above added codes and standards are in accordance with the guidelines given in RG 1.189, Revision 1 where applicable. Additionally, two footnotes were removed from DCD Table 9.5-2 that do not apply to the Fermi 3 COL application. The staff finds that Fermi 3 COL FSAR fully addresses this Supplemental Information Item.

- STD SUP 9.5.1-3

Combustible and Ignition Source Controls

The following portion of this technical evaluation section is reproduced from Section 9.5.1 of the North Anna SER (ADAMS Accession No. ML091730520):

- STP SUP 9.5.1-3

Combustible and Ignition Source Controls

The NRC staff reviewed revised FSAR Section 9.5.1.15.6 and the applicant's responses to RAIs 09.05.01-5, 6, 7, and 13 to add combustible and ignition source controls for areas adjacent to the MCR and in computer rooms that are not part of the control room complex and prohibit storage of transient combustibles below the raised floor in the MCR complex and prohibit the storage of hazardous chemicals in areas that contain or expose equipment important to safety. The staff finds that the responses to these RAIs (significant RAIs for this issue shown below) are acceptable and that the proposed FSAR revision has been incorporated into the North Anna 3 COL FSAR Revision 1 as required.

RAI 09.05.01-5 "Automatic Suppression in Rooms Adjacent to MCR"

Summary:

Describe the program to control the MCR complex fire hazard presented by paper or other combustible materials, as well as ignition sources (e.g., coffee makers).

Resolution:

The ESBWR DCD took exception to the RG 1.189 guidance to provide automatic suppression in the rooms adjacent to the MCR. The applicant's response to RAI 09.05.01-5 stated that in addition to the administrative controls described in the ESBWR DCD, the North Anna 3 FSAR will be revised to include administrative requirements to specifically control combustible materials and potential sources in rooms adjacent to the MCR. The NRC staff finds that the response to this RAI is acceptable and that the proposed FSAR revision has been incorporated into the North Anna 3 COL FSAR Revision 1 as required.

RAI 09.05.01-6 "Automatic Suppression below the Raised Floor in the MCR Complex"

Summary:

The ESBWR DCD took exception to the RG 1.189 guidance to providing automatic fire suppression below the raised floor in the MCR complex. Describe the approach to restricting transient combustibles in this area. Also describe the extent to which cabling below the raised floor will be contained in conduit.

Resolution:

The applicant's response to RAI 09.05.01-6 stated that in addition to the administrative controls described in the ESBWR DCD, the North Anna 3 COL FSAR will be revised to prohibit the storage of transient combustibles below the raised floor in the MCR complex. The NRC staff finds that the response to this RAI is acceptable and that the proposed FSAR revision has been incorporated into the North Anna 3 COL FSAR Revision 1 as required.

RAI 09.05.01-7 "Automatic Suppression for Computer Rooms that are not part of the MCR Complex"

Summary:

The ESBWR DCD took exception to the RG 1.189 guidance to providing fixed automatic suppression for computer rooms for computers performing functions important to safety that are not part of the Control Room Complex. Describe the program to control the fire hazard presented by paper or other combustible materials, as well as potential ignition sources in these rooms.

Resolution:

The applicant's response to RAI 09.05.01-7 stated that in addition to the administrative controls described in the ESBWR DCD, the North Anna 3 COL FSAR will be revised to include administrative requirements to specifically control combustible materials and potential sources in computer rooms that are not part of the MCR complex. The NRC staff finds that the response to this RAI is acceptable and that the proposed FSAR revision has been incorporated into the North Anna 3 COL FSAR Revision 1 as required.

Significant RAI Responses Not addressed above (all RAIs are resolved)

RAI 09.05.01-2 "Multiple Spurious Actuations"

Summary:

What assumptions and methodologies will be used by the applicant to identify, assess, and resolve the potential for multiple spurious actuations that may prevent post-fire safe-shutdown?

Resolution:

The applicant stated that General Electric-Hitachi will perform all safe shutdown analysis for the ESBWR plant and, therefore, this issue will be addressed in the DCD and is being tracked as Open Item 1-1. The NRC staff finds that the response to this RAI is acceptable and that there are no FSAR changes required.

RAI 09.05.01-18 "Smoke Detectors in the MCR Cabinets and Consoles"

Summary:

The ESBWR DCD took exception to the RG 1.189 guidance to providing smoke detectors in the control room cabinets and consoles. Describe the cabinet design features that will facilitate the rapid identification of the specific cabinet/console that is on fire and facilitate rapid access to the cabinets/consoles for fire fighting.

Resolution:

The applicant's response to RAI 09.05.01-18 stated that requirements to develop specific fire fighting procedures and train fire brigade members are addressed in the ESBWR DCD and in the North Anna 3 COL FSAR. ESBWR DCD, Section 9.5.1.15.5 requires that procedures be developed to, in part; define the strategies established for fighting fires in safety-related areas and areas presenting a hazard to safe shutdown equipment. Strategies for fighting fires in the MCR will be included in these procedures and will address specific cabinet design features, as appropriate. The development of these procedures will be as per North Anna 3 COL FSAR Table 13.5-202.

The NRC staff finds that the response to this RAI is acceptable and that there are no FSAR changes required.

With respect to RAI 09.05.01-2 identified above, this RAI was resolved in Revision 6 of the ESBWR DCD Tier 2, Subsection 9.5.1.10. The applicant incorporated this subsection by reference accordingly. The staff evaluated Supplemental Information STD SUP 9.5.1-3 using the relevant NRC regulations and acceptance criteria in Section 9.5.1 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed STD SUP 9.5.1-3.

9.5.1.5 Post Combined Licensing Activities

The applicant has proposed the following commitments in this section:

- Commitment (COM 9.5-001) Testing will be performed to demonstrate that the secondary fire protection pump circuit supplies a minimum of 484 m³/hr (2130 gpm) with sufficient discharge pressure to develop a minimum of 738 kPaG (107 psig) line pressure at the Turbine Building/yard interface boundary. This cannot be performed until the system is built. This activity will be completed prior to fuel receipt.
- Commitment (COM 9.5-002) Mechanical and electrical penetration seals and electrical raceway fire barrier systems are qualified to the requirements delineated in RG 1.189 by a recognized laboratory in accordance with the applicable guidance of NFPA 251 and/or ASTM E-119. Detailed design in this area is not complete. Specific design and certification test results for penetration seal designs and electrical raceway fire barrier systems will be available for review at least six months prior to fuel receipt.
- Commitment (COM 9.5-003) – Procedures for manual smoke control will be developed as part of Fire Protection Program implementation.
- Commitment (COM 9.5-004) – A compliance review of the final as-built design against the assumptions and requirements stated in the FHA will be completed prior to fuel load.

- Commitment (COM 9.5-006) – Implementation of the fire brigade will be in accordance with the milestone in Section 13.4 for the Fire Protection Program.
- Commitment (COM 9.5-007) – The procedures will be developed six months prior to fuel receipt and will be fully implemented prior to fuel receipt.
- Commitment (COM 9A-001) – A detailed fire hazards analysis of the yard area that is outside the scope of the certified design cannot be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load.
- Commitment (COM 9A-002) – A detailed fire hazards analysis of the yard area that is outside the scope of the certified design, which includes the Service Building, cannot be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load.
- Commitment (COM 9A-003) – A detailed fire hazards analysis of the yard area that is outside the scope of the certified design, which includes the Service Water/Water Treatment Building, cannot be completed until cable routing is performed during final design. This information will be provided six months prior to fuel load.

9.5.1.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG–1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the fire protection system, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the fire protection system, that were incorporated by reference are resolved.

For the purposes of the staff's Subsection 9.5.1 review, the staff finds that it is reasonable to conclude that the identified Tier 2 Departure DEP 11.4-1 for this section do not require prior NRC approval per 10 CFR Part 52 Appendix E Section VIII.B.5.

In addition, the staff compared the supplemental information in the COL application to the relevant NRC regulations, the guidance in Section 9.5.1 of NUREG–0800, and other NRC regulatory guides. The staff's review concludes that the applicant's information in the COL FSAR is acceptable and meets the requirements of GDC 3, 5, 19 and 23 of Appendix A to 10 CFR Part 50 and 10 CFR 50.48, 52.79(d), 52.80(a), and the criteria in SECY-90-016, SECY-93-087 and SECY-94-084, along with the guidance in RGs 1.189 and 1.206. The also finds that the applicant satisfactorily addressed the EF3 COL items, STD COL items, EF3 SUP items, and STD SUP items identified in this section.

9.5.2 Communication Systems

9.5.2.1 Introduction

This FSAR section describes the communication systems which provide interplant communications and plant-to-offsite communications during normal, maintenance, transient, fire, and accidents conditions.

9.5.2.2 Summary of Application

Section 9.5.2 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.5.2 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Section 9.5.2, the applicant provides the following:

COL Items

- EF3 COL 9.5.2.5-1-A Emergency Notification System

This COL item requested a description of the emergency notification system (ENS). The applicant stated that this COL item is addressed in FSAR Subsection 9.5.2.2.

- EF3 COL 9.5.2.5-2-A Grid Transmission Operator

This COL item requested a description of the transmission system operator communication link. The applicant stated that this COL item is addressed in FSAR Subsection 9.5.2.2 and in the Emergency Plan Section II.F.1.

- EF3 COL 9.5.2.5-3-A Offsite Interfaces (1)

This COL item requested a description of the means of communication between the MCR, technical support center (TSC), emergency operations facility (EOF), state and local emergency operation centers and radiological field personnel in accordance with NUREG-0696, "Functional Criteria for Emergency Response Facilities," issued February 1981, and NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," issued in November 1980. The applicant stated that this COL item is addressed in FSAR Subsection 9.5.2.2 and in the Emergency Plan Sections II.E.1 and II.F.1.

- EF3 COL 9.5.2.5-4-A Offsite Interfaces (2)

This COL item requested a description of the communication methods from the MCR, TSC, and EOF to the NRC headquarters including establishment of emergency response data systems (ERDS) in accordance with NUREG-0696. The applicant stated that this COL item is addressed in FSAR Subsection 9.5.2.2 and in the Emergency Plan Sections II.E.1 and II.F.1.

- EF3 COL 9.5.2.5-5-A Fire Brigade Radio System

This COL item requested a description of the fire brigade radio system. The applicant stated that this COL item is addressed in FSAR Subsection 9.5.2.2.

9.5.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the communication systems and the associated acceptance criteria are in Section 9.5.2 of NUREG-0800.

Also, specific applicable regulatory requirements for the communications associated with and in support of the Fermi 3 COL items are as follows:

- 10 CFR Part 50, Appendix E, Part IV.E.9
- 10 CFR 50.47(b)(5) and (b)(6)

The related acceptance criteria are as follows:

- NRC Bulletin (BL) 80-15, "Possible Loss of Emergency Notification System (ENS) with Loss of Offsite Power," June 18, 1980
- NUREG-0696
- NUREG-0654/FEMA-REP-1
- RG 1.189, Section 4.1.7
- GL 91-14, "Emergency Telecommunications," dated September 23, 1991

9.5.2.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.5.2 of the certified ESBWR DCD. The staff reviewed Section 9.5.2 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of information relating to this review topic.¹ The staff's review confirms that the information in the application and the information incorporated by reference address the required information related to the Communication Systems.

The staff also examined the Fermi 3 Emergency Plan Sections II.E and II.F that are relevant to the COL item responses. The detailed review of the Emergency Plan Sections II.E and II.F is reflected in SER Section 13.3, "Emergency Planning." The staff reviewed conformance of Section 9.5.2 of the Fermi 3 COLA FSAR to the regulatory basis and guidance listed in Section 9.5.2.3 above and the guidance in RG 1.206, Regulatory Positions C.III.1, and, C.I.9.5.2, "Communication Systems."

COL Items

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

- EF3 COL 9.5.2.5-1-A

Emergency Notification System

The NRC staff reviewed COL Item EF3 COL 9.5.2.5-1-A related to the ENS included under Subsection 9.5.2.5 of the Fermi 3 COL FSAR. The DCD COL Item 9.5.2.5-1-A states that, "The COL applicant will describe the Emergency Notification System provisions required by 10 CFR 50.47(b)(6) and address recommendations described in BL-80-15." The applicant addressed this item in FSAR Subsection 9.5.2.5 in their application by describing key features of the ENS.

10 CFR 50.47(b)(6) requires that provisions exist for prompt communications among principal response organizations to emergency personnel and to the public. The key provisions of NRC BL 80-15 state in part that, "... all extensions of the ENS located at your facility(ies) would remain fully operable from the facility(ies) to the NRC Operations Center in the event of a loss of offsite power to your facility(ies)." The ENS is a dedicated NRC Federal Technology Services (FTS)-2001 system that is normally used only for plant communications with the NRC and is independent from other site telephone systems. The ENS provides a means for initial notifications to the NRC, as well as ongoing communications about plant systems, status, and parameters. FTS-2001 telephones for the ENS are located in the MCR, TSC and EOF. The ENS phone lines connect via fiber optics (see Figure II.F-1, in COL Application Part 5: Emergency Plan) to the local telephone company (Century Telephone Company). This telephone system is normally powered by two redundant alternating current (ac) power sources. These power sources are backed up by batteries with an 8 hour capacity rating, which would automatically supply power to the ENS phones if a complete loss of AC power (to the phones) occurred. The applicant states, "This design ensures that the ENS located at the site is fully operable from the site in the event of a loss of offsite power at the site and is in compliance with the guidance of NRC BL 80-15 for the ENS." Through EF3 COL 9.5.2.5-1-A, Fermi 3 committed that the ENS is in compliance with the recommendations of NRC BL 80-15, which is concerned with having a, "... safeguards instrumentation bus backed up by automatic transfer to batteries and an inverter or equally reliable power supply." Accordingly, based on the description provided in COL Item EF3 COL 9.5.2.5-1-A, the information in Fermi 3 COL Application Part 5: Emergency Plan, Section II.F, on emergency communications, and the description in ESBWR DCD, Section 9.5.2, the staff finds that the applicant has adequately addressed the recommendations in NRC BL 80-15. Also, Fermi 3 has multi-line Radiological Emergency Response Preparedness (RERP) telephones (marked for "Emergency Use Only") that have an ENS button to allow access to the ENS. Furthermore, the applicant states, "If the ENS is inoperable, the required notifications can be made via commercial telephone or any other method to ensure that a report is made as soon as practical."

During the review, the staff noted that it was unclear if the RERP is intended as a backup to the ENS or an alternate access. In RAI 09.05.02-1 the NRC staff requested the applicant to clarify whether the RERP is intended as a backup to the ENS or an alternate access and what specific systems are referred to by, "... the required notifications can be made via commercial telephone or any other method to ensure that a report is made as soon as practical," so the evaluation of EF3 COL 9.5.2.5-1-A could be completed. In response to this RAI dated September 24, 2009 (ADAMS Accession No. ML092720656), the applicant revised FSAR Subsection 9.5.2.2 to clarify that there is no specific backup system for the ENS. In the event the ENS is unavailable, notifications can be made through a number of alternate methods. These include: (1) the RERP phone system that is a dedicated phone system with battery backup; (2) the AT&T phone system that is intended to provide communication with local and state authorities; (3) the commercial phone system; and (4) the 800 megahertz (MHz) band radio communications with local law enforcement agencies. The staff finds the applicant's response to RAI 09.05.02-1 is acceptable because several alternate communication methods are available including at least

one with a battery backup and meets the guidance of NRC BL 80-15. RAI 09.05.02-1 is therefore closed.

Based on the above information, the staff finds that the applicant has adequately addressed the DCD COL Item 9.5.2.5-1-A, because the design meets the requirements of 10 CFR 50.47(b)(6) and guidance of NRC BL 80-15.

- EF3 COL 9.5.2.5-2-A Grid Transmission Operator

The NRC staff reviewed COL Item EF3 COL 9.5.2.5-2-A related to the grid transmission operator communications included under Subsection 9.5.2.5 of the Fermi 3 COL FSAR. The DCD COL Item 9.5.2.5-2-A states, "The COL applicant will describe the voice communication link availability with the grid transmission operator." The applicant addressed this item in FSAR Subsection 9.5.2.2 and in Emergency Plan Section II.F.1.

The NRC staff reviewed the applicant's resolution to the DCD COL Item 9.5.2.5-2-A involving the grid transmission operator communication link included under Subsection 9.5.2.2 of the Fermi 3 COL FSAR and addressed in Emergency Plan Section II.F.1. In DCD Subsection 9.5.2.2 under Emergency Communication Systems, "(COL 9.5.2.5-1-A)" the last bullet is replaced by a paragraph labeled "EF3 COL 9.5.2.5-2-A" that states, "Transmission System Operator Communications Link: Voice communications with the grid operator are provided via a company-owned and company-maintained transmission system that allows telephone communications with the entire Corporate System. Access to this mode of transmission is made via the plant telephone system. A dedicated line is provided between the Control Room and the power system operator." Furthermore, this mode of communication to the grid transmission operator is backed up by the regular commercial telephone system. The Fermi 3 COL Application Part 5: Emergency Plan, Section II.F.1, states that Detroit Edison has extensive and reliable communications systems installed at Fermi 3 and maintains the capability to make initial notifications to the designated offsite agencies on a 24-hour per day basis. Section II.F.1 also describes the various and diverse communication systems (see Figure II.F-1, COL Application Part 5: Emergency Plan) and backup methods that are available for use in emergency events as well as normal operations.

10 CFR 50.47(b)(6) requires that, "Provisions exist for prompt communications among principal response organizations to emergency personnel and to the public." DCD Section 9.5.2, "Communications System," lists communications subsystems that are to provide the means to conveniently and effectively communicate between various parts of the nuclear power plant and with offsite company, governmental, support agencies, and other locations during normal operations, testing and drills, and during maintenance, transients, fire, emergency, and accident conditions under maximum potential noise levels. These subsystems include the capability to communicate with the Grid Transmission Operator through the normal means of the company-owned and company-maintained transmission system as well as through alternate means, with primary power backed up by battery power as described.

Based on the above information, the staff finds that the applicant has adequately addressed DCD COL Item 9.5.2.5-2-A, because the design provides for primary and backup communication capability to the grid transmission operator and meets the requirements of 10 CFR 50.47(b)(6).

- EF3 COL 9.5.2.5-3-A Offsite Interfaces (1)

The NRC staff reviewed COL Item EF3 COL 9.5.2.5-3-A related to the offsite interfaces included under Subsection 9.5.2.5 of the Fermi 3 COL FSAR and examined the Emergency Plan Sections II.E and II.F as related to emergency communications.

The DCD COL Item 9.5.2.5-3-A states, “The COL applicant will describe the means of communication between the control room, TSC, EOF, state and local emergency operation centers and radiological field personnel in accordance with NUREG-0696 and NUREG-0654 (Subsection 9.5.2.2).” The applicant addressed EF3 COL 9.5.2.5-3-A in FSAR Subsection 9.5.2.2 and Emergency Plan Sections II.E.1 and II.F.1. EF3 COL 9.5.2.5-3-A states, “The health physics network is described in the Emergency Plan.” In Subsection 9.5.2.2 under Emergency Communication Systems EF3 COL 9.5.2.5-3-A states, “The crisis management radio system is part of the plant radio system described in DCD Section 9.5.2.2.”

NUREG-0696, in part, specifies the voice and data communication support required for the TSC, operational support center (OSC), and the EOF, and the relationship of these to the MCR. NUREG-0654, Supplement 1, Section II.E in part specifies notification methods and procedures for offsite communications in support of emergency preparedness. NUREG-0654, Supplement 1, Section II.F in part specifies emergency communications for offsite communications in support of emergency preparedness. These requirements are addressed in the Fermi 3 COL Application Part 5: Emergency Plan including Sections II.E and II.F. The Fermi 3 COL Application Part 5: Emergency Plan including Sections II.E and II.F is evaluated in SER Section 13.3, “Emergency Planning” of this SER.

10 CFR Part 50, Appendix E, Section IV.E.9 requires “At least one onsite and one offsite communications system; each system shall have a backup power source.” Section 9.5.2 describes the site communications system that is composed of multiple diverse communications subsystems that includes at least one onsite and one offsite communications system with a backup power source as summarized below.

Section 9.5.2 identified site communication subsystems that made up the communications system as follows:

- Plant page/party-line subsystem;
- Private automatic branch exchange subsystem;
- Plant sound-powered telephone subsystem;
- Plant radio subsystem;
- Evacuation alarm and remote warning subsystem;
- Emergency offsite communication subsystem; and
- Completely independent radio communications subsystem for security purposes.

Subsection 9.5.2.1 provides the safety design basis and the power generation design basis while Subsection 9.5.2.2 provides a summary system description for these site communications except for the completely independent radio subsystem for security purposes that is described in ESBWR DCD, Section 13.6. More description of these communication systems is found in the applicant’s COL application Part 5: (Emergency Plan), Sections II.E and II.F. The detailed review of the completely independent radio subsystem for security purposes is reflected in SER Section 13.6, “Physical Security” of this SER.

The communications system is considered a nonsafety system, because it serves no safety-related function and the reactor can be shut down without the communications system. However, an adequate communications system is both required by regulation and considered important to overall safety as well as power generation. The subsystems identified above are independent of one another such that a failure in one subsystem does not adversely affect the performance of the other subsystems.

Based on the capability of these communications described in Section 9.5.2, the staff finds the design of the communications system adequately meets the requirements of 10 CFR Part 50, Appendix E, Section IV.E.9, because the multiple communication subsystems provide at least one onsite and one offsite communications system with each system having a backup power source.

10 CFR 50.47(b)(5) requires that, "Procedures have been established for notification, by the licensee, of state and local response organizations and for notification of emergency personnel by all organizations; the content of initial and follow-up messages to response organizations and the public has been established; and means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone have been established." The COL application Part 5: Emergency Plan, Sections II.E, describes the Fermi 3 notification methods and procedures which are evaluated in Section 13.3 of this SER.

10 CFR 50.47(b)(6) requires that, "Provisions exist for prompt communications among principal response organizations to emergency personnel and to the public." Section 9.5.2, "Communications System," lists communications subsystems that are to provide the means to conveniently and effectively communicate between various parts of the nuclear power plant and with offsite company, governmental, support agencies, and other locations during normal operations, testing and drills, and during maintenance, transient, fire, emergency, and accident conditions under maximum potential noise levels. Based on the capability of these communications described in Section 9.5.2, the staff finds the design of the communications system adequately meets the requirements of 10 CFR 50.47(b)(6) because the multiple communication subsystems provide acceptable means of communication between the control room, TSC, EOF, state and local emergency operation centers, and radiological field personnel communications system as well as alternate independent means of communication in case of the failure of the primary planned subsystem, many with a backup power source.

In the Fermi 3 COL Application Part 5: Emergency Plan Section II.E, the applicant states that Detroit Edison, in cooperation with state, county, and provincial authorities, has established mutually agreeable methods and procedures for notification of offsite response organizations consistent with the emergency classification and action level scheme. Furthermore, Part 5: Emergency Plan, Section II.E describes the methods and procedures needed to provide the capability for 24-hour per day prompt notification and mobilization of emergency response organizations including plant personnel, offsite emergency response organizations, the State of Michigan, adjacent Counties of Monroe and Wayne, the NRC, the Canadian Province of Ontario, Detroit Edison corporate offices including the Detroit Edison Nuclear Information Department, and the others as needed.

In the Fermi 3 Emergency Plan, Section II.F describes the provisions for a diverse set of systems for communication (see Figure II.F-1 of the Emergency Plan) between the Fermi 3 site and principal response organizations, including state, local, and federal agencies as stated above, and communications between the emergency response facilities. In case of the failure of the primary communication system or loss of normal power, either battery backup or alternate

systems are available. For example, backup notification and communication can be made through the commercial telephone network system or the Detroit Edison-owned microwave system routed from the Fermi site to the General Offices in Detroit then to any desired location.

The Emergency Plan implementing procedures describe use of communications systems during an emergency, and the Emergency Plan administrative procedures provide additional details describing testing and maintenance of communications systems. Message content and verification methods are established in advance in implementing procedures. Communication systems that allow communications between the site and fixed and mobile medical support facilities are maintained and include both commercial telephone communications with fixed facilities and radio communications to ambulances. Equipment, methods, and procedures for communication are tested and evaluated on a periodic basis through test and drills. For example, Fermi 3 conducts periodic testing of communications systems at the site consistent with communications drill requirements. Communications between the Fermi 3 emergency response facilities and the state/county warning points are tested monthly. Communications between the state/local emergency operation centers and field assessment teams are tested consistent with the requirements of the affected state and county plans. The Fermi 3 COL Application Part 5: Emergency Plan lists the requirements and the corresponding COL application Emergency Plan provision where the requirement is addressed.

Based on the above information, the staff finds that the applicant has adequately addressed DCD COL Item 9.5.2.5-3-A because the communication system design described provides means to meet the requirements of 10 CFR Part 50, Appendix E, Section IV.E.9, 10 CFR 50.47(b)(5), 10 CFR 50.47(b)(6); in addition to the standards/criteria/guidance in NUREG-0696, and NUREG-0654, Supplement 1, Section II.E and II.F.

- EF3 COL 9.5.2.5-4-A Offsite Interfaces (2)

The NRC staff reviewed COL Item EF3 COL 9.5.2.5-4-A related to the offsite interfaces included under Subsection 9.5.2.5 of the Fermi 3 COL FSAR and examined Fermi 3 Emergency Plan Sections II.E and II.F. The DCD COL Item 9.5.2.5-4-A states, "The COL applicant will describe the communication method from the control room, TSC, and EOF to NRC headquarters, including establishment of Emergency Response Data Systems (ERDS) in accordance with NUREG-0696 (Subsection 9.5.2.2)." The applicant addressed this Item with EF3 COL 9.5.2.5-4-A stating, "This COL item is addressed in Subsection 9.5.2.2 and Emergency Plan Sections II.E.1 and II.F.1." EF3 COL 9.5.2.5-4-A also states, "Communication from the Control Room, TSC, and EOF to NRC headquarters including establishment of Emergency Response Data System (ERDS) is described in the Emergency Plan." The Fermi 3 COL Application Part 5: Emergency Plan including Sections II.E and II.F is evaluated in SER Section 13.3, "Emergency Plan" of this SER.

NUREG-0696 in part specifies the voice and data communication support required for the TSC, OSC, and the EOF, and the communication of these with the MCR. Section 9.5.2 identifies site communication subsystems that made up the communications system and these subsystems are listed in "Offsite Interfaces (1)" above. These requirements are addressed in the Fermi 3 Emergency Plan including Sections II.E and II.F which are summarized below.

In the Fermi 3 COL Application Part 5: Emergency Plan Section II.F.1, the applicant states that Fermi 3 maintains the capability to make initial notifications to the designated offsite agencies on a 24-hour per day basis. The offsite notification ringdown phone system provides communications to state and county warning points, and emergency operation centers from the

MCR, TSC and EOF (see Figure II.F-1 of the Emergency Plan). Backup methods include commercial telephone lines, radios, microwave, and facsimile. Separate telephone lines are dedicated and maintained for communications with the NRC. These include the ENS, the Health Physics Network (HPN), the Reactor Safety Counterpart Link (RSCL), the Protective Measures Counterpart Link (PMCL), an ERDS Channel, the Management Counterpart Link (MCL), and the Local Area Network (LAN) Access. The ENS lines located in the MCR, TSC, and EOF, are used for initial notifications to the NRC, as well as ongoing information about plant systems, status, and parameters. The HPN lines located in the TSC and EOF provide for communication concerning radiological and meteorological matters. The RSCL lines located in the TSC and EOF provide for internal NRC discussions regarding plant and equipment conditions. PMCL lines located in the TSC and EOF provide for internal NRC discussions on radiological releases, meteorological conditions, and protective measures. The ERDS Channel allows transmittal of selected plant data to the NRC Operations Center on a continuing basis in an emergency. The MCL lines located in the TSC and EOF provide for internal discussion between the NRC Executive Team Director and members of the NRC Executive Team Director's team and the NRC site director, or between licensee site management. The LAN Access with jacks in the TSC and EOF provides access to the NRC LAN.

The Fermi 3 COL Application Part 5: Emergency Plan lists the requirements and the corresponding COL application Emergency Plan provisions that address the requirements. The staff finds the design adequately addresses GL 91-14 because the communications system as described contains all of the subsystems indicated for communications with the NRC specified in Enclosure 1 of GL 91-14, including ENS, HPN, RSCL, PMCL, MCL, ERDS, and LAN.

Based on the above under "Offsite Interfaces (1)" and "Offsite Interfaces (2)," the staff finds that the applicant has adequately addressed the DCD COL Item 9.5.2.5-4-A, because the communications system design described provides means to communicate effectively between and among the MCR, TSC, EOF, and NRC headquarters, including establishment of a ERDS and meets the guidance of NUREG-0696.

- EF3 COL 9.5.2.5-5-A Fire Brigade Radio System

The NRC staff reviewed COL Item EF3 COL 9.5.2.5-5-A related to the fire brigade radio system included under Subsection 9.5.2.5 of the Fermi 3 COL FSAR. The DCD COL Item 9.5.2.5-5-A states, "The COL applicant will describe the Fire Brigade Radio System in accordance with RG 1.189, Position 4.1.7." The applicant addressed this item with EF3 COL 9.5.2.5-5-A that states, "This COL item is addressed in Subsection 9.5.2.2." EF3 COL 9.5.2.5-5-A states that, "Compliance of the Fire Brigade Radio System with RG 1.189, Position 4.1.7, is described in DCD Section 9.5.2.2."

RG 1.189, Regulatory Position 4.1.7, acceptance criteria states that the communication system design should provide effective communication between plant personnel in all vital areas during fire conditions under maximum potential noise levels. Furthermore, two-way voice communications devices should provide: (a) fixed emergency communications independent of the normal plant communication system installed at preselected stations and (b) a portable radio communications system for use by the fire brigade and other operations personnel required to achieve safe plant shutdown that should not interfere with the communications capabilities of the plant security. Fixed repeaters installed to permit the use of portable radio communication units should be protected from exposure or fire damage. Preoperational and periodic testing should demonstrate that the frequencies used for portable radio communication will not affect the actuation of protective relays.

The ESBWR DCD, Subsection 9.5.2.2 states that the plant radio system complies with performance guidelines applicable to portable radio communication systems in RG 1.189, Regulatory Position 4.1.7, as described above.

The ESBWR DCD, Subsection 9.5.2.2 also describes the plant radio system for use during normal and emergency communications within the plants. The plant radio system radios are equipped with multiple channels including a fire brigade channel and an emergency channel, each of which can be used as an alternate security channel if required. Portable, hand-held radios provide two-way mobile voice communication between individual members or units of the fire brigade in the plant and satellite buildings and communication from the fire brigade units or individual members to communication consoles in selected plant locations including the MCR and remote shutdown rooms. The radio system includes antennas distributed throughout the plant with a centralized rebroadcast transmitter providing communication within the plant and satellite buildings. The communication consoles are connected by hardwired links, thus providing a means of communication between selected areas of the plant even with the failure of the radio base station, the PA/PL system, and the PABX system.

Lower power portable radios are used with this system to ensure that there is no electromagnetic interference with instrumentation and control circuits, and operate at frequencies that ensure they do not interfere with DCIS functions. By using radio equipment equipped with a feature called "tone-coded squelch", communications can be directed to or limited to a specific individual, directed to all-channels (zoned), or directed to all-system calls. However, the emergency channel is not coded and thus is not blocked by this feature in order to keep it available for general use and in case of an emergency. Capability is provided whereby calls can be made between the telephone system and the in-plant radio system. The power for base stations and consoles is provided by a security system power supply backed up by batteries and a standby generator.

The plant radio system is considered nonsafety, but meets the single failure criteria with redundancy in equipment including the potential use of the completely independent security radio communications system as an alternate. Based on this redundancy in equipment and the design features noted above, the NRC staff concludes that mobile radio communications would still be available even if the MCR had to be evacuated.

Based on the above, the staff finds that the applicant has adequately addressed the DCD COL Item 9.5.2.5-5-A because the fire brigade radio system design as described meets the guidance of RG 1.189, Regulatory Position 4.1.7.

9.5.2.5 Post Combined License Activities

There are no post COL activities related to this section.

9.5.2.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the communication systems, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the communication systems that

were incorporated by reference are resolved.

In addition, to the extent that an item addresses that portion of the communications system used in intra-plant and plant-to-offsite communications, the staff concludes that the site specific COL information items discussed in this section of the COL FSAR are acceptable and meet the requirements of 10 CFR Part 50, Appendix E, Section IV.E.9 and 10 CFR 50.47(b)(5) and (b)(6); and guidance in RG 1.189, Regulatory Position 4.1.7. The staff bases its conclusion on the following: (1) The design provides for at least one acceptable onsite and one acceptable offsite communication system, each with a backup power source as described directly through COL application information or information incorporated by reference of the ESBWR DCD; (2) the design provides communications systems with a capability for prompt notification and continuing communication to the NRC; (3) the design provides communications systems with capability for prompt notification and continuing communication with site, local and state response organizations as well as an initial notification to the Province of Ontario, Canada; (4) the design provides a variety of diverse communication systems involving both private links, commercial links, site public address, microwave, facsimiles, and radio with the capability of adequately supporting both normal use and emergency situations; and (5) the nonsafety communication systems do not prevent completion of safety functions.

9.5.3 Lighting System

The plant lighting systems are composed of the normal lighting system, the standby lighting system, and the emergency lighting system. The normal lighting system is used to provide normal illumination under normal plant operating, maintenance, and testing conditions. The standby lighting system is designed to provide a minimum level of illumination to selected areas of the plant to aid in emergencies, safe shut down, or in restoring the plant to normal operation. The emergency lighting system is used to provide acceptable levels of illumination throughout the station upon the loss of the normal lighting system.

Section 9.5.3 of the Fermi 3 COL FSAR incorporates by reference Section 9.5.3, "Lighting System," of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff's review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to lighting system that were incorporated by reference are resolved.

9.5.4 Diesel Generator Fuel Oil Storage and Transfer System

9.5.4.1 Introduction

This FSAR section describes the diesel generator fuel oil storage and transfer system (DGFOSTS) for the diesel engines that provide standby onsite power. The system for each diesel engine includes a fuel oil storage tank, fuel oil day tank, fuel oil transfer pump, strainers/filters, oil purifier (or tank connections for tying into a purification system), instrumentation, controls, and the necessary interconnecting piping and valves. The ESBWR

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

design provides two sets of diesel generators (DGs) – standby diesel generators (SDGs) and ancillary diesel generators (ADGs).

9.5.4.2 Summary of Application

Section 9.5.4 of the Fermi 3 COL FSAR, Revision 7, incorporates by reference Section 9.5.4 of the certified ESBWR DCD, Revision 10. In addition, in Fermi 3 COLA FSAR, Section 9.5.4, the applicant provides the following:

COL Items

- STD COL 9.5.4-1-A Fuel Oil Capacity

The applicant provided additional information in STD COL 9.5.4-1-A to address DCD COL Item 9.5.4-1-A. The applicant described the procedural controls in place to ensure that sufficient fuel oil is available onsite to allow each DG to operate continuously for seven days at its calculated design load.

- EF3 COL 9.5.4-2-A Protection of Underground Piping

The applicant provided additional information in EF3 COL 9.5.4-2-A to address DCD COL Item 9.5.4-2-A. The applicant stated that the underground piping portion of the DGFOSTS is made of carbon steel and that it is protected with a waterproof coating and an impressed current cathodic protection system to control external corrosion.

9.5.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is in NUREG-1966. In addition, the relevant requirements of the Commission regulations for the DGFOSTS and the associated acceptance criteria are in Section 9.5.4 of NUREG-0800.

The specific regulatory requirements are as follows:

- GDC 17, “Electric power systems,” requires an onsite electric power system to permit functioning of SSCs important to safety. The SDGs and ADGs are not classified as safety-related. However, since the diesels are RTNSS Criterion B and C systems, availability of both SDGs and ADGs is required according to the Availability Controls Manual (Availability Control Limiting Condition for Operation 3.8.1 and 3.8.2).
- RG 1.137, “Fuel-Oil Systems for Standby Diesel Generators,” provides regulatory guidance with respect to maintaining a 7-day supply of fuel oil and for protection of the system from internal and external corrosion.

9.5.4.4 Technical Evaluation

As documented in NUREG-1966, the NRC staff reviewed and approved Section 9.5.4 of the certified ESBWR DCD. The staff reviewed Section 9.5.4 of the Fermi 3 COL FSAR, Revision 7, and checked the referenced ESBWR DCD to ensure that the combination of the information in the COL FSAR and the information in the ESBWR DCD represents the complete scope of

information relating to this review topic.¹ The staff's review confirms that the information in the application and the information incorporated by reference address the required information related to the DGFOSTS.

The SDGs and ADGs are not classified as safety-related. However, since the staff reviewed and accepted the diesels as RTNSS Criterion B and C systems in Chapter 19 of NUREG-1966, availability of both SDGs and ADGs is required according to the Availability Controls Manual (Availability Control Limiting Condition for Operations 3.8.1 and 3.8.2).

Section 1.2.3 of this SER discusses the NRC's strategy for performing one technical review for each standard issue outside the scope of the DC and to use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER with open items issued for the North Anna application are equally applicable to the Fermi 3 COL application, the staff undertook the following reviews:

- The staff compared the North Anna COL FSAR, Revision 1, to the Fermi 3 COL FSAR. In performing this comparison, the staff considered changes made to the Fermi 3 COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the North Anna SER with open items.
- The staff confirmed that the applicant has endorsed all responses to the RAIs identified in the corresponding standard content (the North Anna SER) evaluation were endorsed.
- The staff verified that the site-specific differences are not relevant to this section.

The staff has completed the review and finds the evaluation performed for the North Anna standard content to be directly applicable to the Fermi 3 COL application. This SER identifies the standard content material with italicized, double-indented formatting.

The staff reviewed the information in the COL FSAR as follows:

COL Items

- STD COL 9.5.4-1-A Fuel Oil Capacity

The following portion of this technical evaluation section is reproduced from Section 9.5.4 of the North Anna SER (ADAMS Accession No. ML091730520):

STD COL 9.5.4-1-A Fuel Oil Capacity

The NRC staff reviewed STD COL 9.5.4-1-A related to the fuel oil capacity included under Section 9.5.4 of the North Anna 3 COL FSAR. DCD COL Item 9.5.4-1-A in Section 9.5.4.6, "COL Information," of the ESBWR DCD specifies that the COL applicant needs to establish procedural controls to ensure a minimum fuel oil capacity is maintained onsite. In FSAR Section 9.5.4.2, "System Description," the applicant addressed DCD COL Item 9.5.4-1-A (STD COL 9.5.4-1-A) by indicating that procedures will be developed in accordance with the milestone and processes described in FSAR Section 13.5, "Plant Procedures." Those procedures will ensure sufficient diesel fuel oil inventory is available onsite so that the DG

¹ See "Finality of Referenced NRC Approvals" in SER Section 1.2.2 for a discussion on the staff's review related to verification of the scope of information to be included in a COL application that references a design certification.

can operate continually for seven days. The procedures will ensure that the quantity of DG fuel oil in the fuel oil storage tanks is monitored on a periodic basis and that the diesel fuel oil usage is tracked against planned deliveries. Regular transport will replenish the fuel oil inventory during periods of high demand and ensure continued supply in the event of adverse weather conditions. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.4-1A in that the necessary procedures will be developed in accordance with FSAR Section 13.5.

*The applicant stated that the procedures will ensure sufficient fuel oil to operate the DGs continually for seven days. In RAI 09.05.04-02, the staff asked the applicant to verify that enough fuel oil inventory is available to operate the DGs at continuous maximum rating for seven days. In their response dated August 4, 2008, the applicant provided an FSAR markup stating that procedures ensure sufficient diesel fuel oil inventory is available onsite so that the standby diesel generators (SDGs) and ancillary DGs can operate continually for seven days with each operating at its calculated design load, with appropriate margins. The staff finds that the term "appropriate margins" is an ambiguous term for use in the FSAR. Therefore the staff requested the applicant, in supplemental RAI (eRAI 2468, Question 10135), to specify that the margins are in accordance with American Nuclear Society 59.51-1997, "Fuel Oil Systems for Safety-Related Emergency Diesel Generators." This is being tracked as **Open Item 9.5.4-01**.*

In response to supplemental RAI 09.05.04-7 dated August 3, 2009 (ADAMS Accession No. ML092180975), the applicant (Dominion) stated that ANS 59.51-1997, "Fuel Oil Systems for Safety-Related Emergency Diesel Generators," is not applicable to the ESBWR nonsafety-related SDGs and ADGs. The applicant (Dominion) updated the North Anna FSAR to describe the sufficient margin for the 7-day fuel oil inventory requirement that accounts for usable fuel in the tank, level instrument uncertainty, and the potential for future load growth. The staff finds this response acceptable since the 7-day fuel oil inventory is maintained in accordance with RG 1.137 with sufficient margin that is clearly defined in the FSAR. In a letter dated September 21, 2010 (ADAMS Accession No. ML102660145), the applicant (Detroit Edison) stated that it accepted Dominion's response to RAI 09.05.04-7 as part of the Fermi 3 application and revised the FSAR to include the margin description. Therefore, this RAI 09.05.04-7 is closed.

The staff evaluated COL Item STD COL 9.5.4-1-A to the relevant NRC regulations and acceptance criteria in Section 9.5.4 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.4-1.

- EF3 COL 9.5.4-2-A Protection of Underground Piping

The NRC staff reviewed EF3 COL 9.5.4-2-A related to the protection of underground piping included under Section 9.5.4 of the Fermi 3 COL FSAR. DCD COL Item 9.5.4-2-A in Subsection 9.5.4.6, "COL Information," of the ESBWR DCD specifies that the COL applicant needs to describe the material and corrosion protection for the underground piping portion of the fuel oil transfer system.

In FSAR Subsection 9.5.4.2, "System Description," the applicant addressed DCD COL Item 9.5.4-2-A (EF3 COL 9.5.4-2-A) by describing the DGFOSTS protection for underground piping. The Fermi 3 COL FSAR states that the underground piping of the DGFOSTS is protected by a waterproof protective coating and an impressed current cathodic protection

system for external corrosion control in accordance with the applicable guidance in ASME B31.1 API Recommended Practice 1632.

The staff finds the API Recommended Practice acceptable because it refers to National Association of Corrosion Engineers (NACE International) Recommended Practice (RP) 0169, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems," which is the same guideline recommended in RG 1.137 for cathodic protection of buried diesel fuel oil piping². ASME B31.1, Appendix IV is an acceptable industry standard for external corrosion control because it addresses underground piping in a manner consistent with NACE International Recommended Practice 0169. For example, Appendix IV references NACE Recommended Practice 1069 and recommends, in addition to a coating, cathodic protection unless it is shown to be unnecessary.

The NRC staff finds that both the provisions for maintaining a 7-day fuel oil supply and the design for protection against internal and external corrosion are in accordance with the applicable guidance provided in RG 1.137. In addition, the design description provided in the Fermi 3 COL FSAR supports the regulatory requirements for an onsite power supply in GDC 17 to the extent that the requirements apply to nonsafety-related DGs classified as RTNSS Criterion B and C systems.

The staff evaluated EF3 COL 9.5.4-2-A to the relevant NRC regulations and acceptance criteria in Section 9.5.4 of NUREG-0800. The staff finds that the applicant has satisfactorily addressed DCD COL Item 9.5.4-2-A.

9.5.4.5 Post Combined License Activities

There are no post COL activities related to this section.

9.5.4.6 Conclusion

The NRC staff's finding related to information incorporated by reference is in NUREG-1966. The NRC staff reviewed the application and checked the referenced DCD. The staff's review confirms that the applicant has addressed the required information relating to the diesel generator fuel oil storage and transfer system, and no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to the diesel generator fuel oil storage and transfer system that were incorporated by reference are resolved. In addition, the staff compared the additional COL supplemental information in the application to the relevant NRC regulations, the guidance in Section 9.5.4 of NUREG-0800, and other NRC regulatory guides. The staff's review concludes that the applicant's information in this section of the COL FSAR is acceptable and meets the requirements of GDC 17 and RG 1.137. The staff also finds that the applicant has satisfactorily addressed DCD COL Items 9.5.4-1-A and 9.5.4-2-A.

9.5.5 Diesel Generator Jacket Cooling Water System

² NACE International RP0169, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems," was reaffirmed in 2007 as NACE International Standard Practice (SP) 0169, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems"

Subsection 9.5.5 of the Fermi 3 COL FSAR incorporates by reference Section 9.5.5, “Diesel Generator Jacket Cooling Water System,” of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff’s review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to diesel generator jacket cooling water system that were incorporated by reference are resolved.

9.5.6 Diesel Generator Starting Air System

Subsection 9.5.6 of the Fermi 3 COL FSAR incorporates by reference Section 9.5.6, “Diesel Generator Starting Air System,” of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff’s review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to diesel generator starting air system that were incorporated by reference are resolved.

9.5.7 Diesel Generator Lubrication System

Subsection 9.5.7 of the Fermi 3 COL FSAR incorporates by reference Section 9.5.7, “Diesel Generator Lubrication System,” of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.¹ The NRC staff’s review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to diesel generator lubrication system that were incorporated by reference are resolved.

9.5.8 Diesel Generator Combustion Air Intake and Exhaust System

Subsection 9.5.8 of the Fermi 3 COL FSAR incorporates by reference Section 9.5.8, “Diesel Generator Combustion Air Intake and Exhaust System,” of the ESBWR DCD, Revision 10, referenced in 10 CFR Part 52, Appendix E, with no departures or supplements. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review¹. The NRC staff’s review confirms that no outstanding information is expected to be addressed in the COL FSAR related to this section. Pursuant to 10 CFR 52.63(a)(5) and 10 CFR Part 52, Appendix E, Section VI.B.1, all nuclear safety issues relating to diesel generator combustion air intake and exhaust system that were incorporated by reference are resolved.

¹ See “Finality of Referenced NRC Approvals” in SER Section 1.2.2 for a discussion on the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification.