Chapter 17 Quality Assurance

17.0 Introduction

Section 17.1 describes the Quality Assurance (QA) Program used by GE Hitachi Nuclear Energy (GEH) for the ESBWR. The program is based on the standard QA Program, documented in topical report NEDO-11209-04A (Reference 17.0-1) and the additional information in this chapter, which describes and clarifies GEH interfaces and responsibilities with its ESBWR project participants. The ESBWR project participants are domestic and international organizations that have extensive independent experience in the design, development, construction and operation of nuclear power plants.

The standard QA Program is used on all nuclear power plant work, and is Nuclear Regulatory Commission (NRC) accepted. The QA Program complies with 10 CFR 50, Appendix B, the implementing ANSI/ASME N45.2 series daughter standards and the Regulatory Guides (RG) shown in NEDO-11209-04A, Table 2-1 (Reference 17.0-1) with some NRC-accepted GEH alternate positions. Regulatory Guides and Standards and their respective revisions, including exceptions, alternatives and clarifications are addressed in the appropriate UFSAR sections and in Table 17.0-1. The QA Program meets RG 1.28, and is organized to show its relationship to ANSI/ASME NQA-1-1983 and NQA-1a-1983.

GEH ESBWR work is controlled through NEDO-33181 (Reference 17.0-2). NEDO-33181 provides the description of the quality assurance plan scope, which GEH, as supplier for ESBWR engineering services, will implement in support of the Department of Energy (DOE) NP-2010 COL Demonstration Project.

Suppliers' and sub-tier suppliers' work is controlled through NEDO-33260 (Reference 17.0-3). NEDO-33260 defines relationships, responsibilities, and requirements for the supplier's quality program. All safety-related suppliers and sub-tier suppliers must have QA plans to meet the applicable requirements of ANSI/ASME NQA-1-1994.

The evolution of the ESBWR design and the use of Simplified Boiling Water Reactor (SBWR) test programs conducted at supplier test facilities for the GIRAFFE, PANTHERS, and PANDA tests are discussed in detail in Section 1.5. Each of these test programs was conducted under the appropriate provisions of NEDG-31831 (Reference 17.0-4), and implemented using GEH approved supplier QA plans. It was required that all of these supplier QA plans either met the requirements of ANSI/ASME NQA-1-1983 and NQA-1a-1983 addenda as endorsed by the NRC in RG 1.28, or the intent of these requirements by reference to equivalent national standards (such as the use of Japanese standard JEAG 4101-1990 for GIRAFFE). Additionally, NEDG-31831 (Reference 17.0-4) provides that design and testing work performed by international technical associates will be performed to their internal QA programs acceptable to the regulatory authorities of their respective countries as evaluated by GEH for compliance with the provisions of ANSI/ASME NQA-1-1983 and

NQA-1a-1983. The NRC has participated in oversight activities related to the testing as documented in NRC Inspection Report Number 99900404/95-02 (Reference 17.0-5). The NRC staff has conducted QA inspections of all of GEH's major design certification test programs (GIST, PANTHERS/PCC, PANTHERS/IC, GIRAFFE, and PANDA) and has concluded that for GIST, PANTHERS, and GIRAFFE, NQA-1 standards were met, or that appropriate remedial actions were taken to correct deficiencies found during those inspections (Reference 17.0-6).

The QAPD applicable to the COL licensee is described in Section 17.5. The licensee's QAPD describes the basis of the program, its scope of activities, and the control of work performed by suppliers.

17.0.1 COL Information

None.

17.0.2 References

17.0-1 GE Nuclear Energy, "GE Nuclear Energy Quality Assurance Program Description," NEDO-11209 04A, Revision 8, March 1989.

17.0-2 GE Hitachi Nuclear Energy, "NP-2010 COL Demonstration Project Quality Assurance Plan," NEDO-33181, Revision 6, August 2009.

17.0-3 GE Hitachi Nuclear Energy, "Quality Assurance Requirements for Suppliers of Equipment and Services to the GEH ESBWR Project," NEDO-33260, Revision 5, April 2008.

17.0-4 GE Nuclear Energy, "SBWR Design and Certification Program Quality Assurance Plan," NEDG-31831, May 1990.

17.0-5 USNRC, "NRC Inspection Report No. 99900404/95-02," September 25, 1995.

17.0-6 USNRC, "Staff Evaluation of General Electric's (GE's) Test and Analysis Program Description, NEDC-32391 Rev. C," July 11, 1996.

Table 17.0-1 Compliance With Quality Assurance Program Commitments (Sheet 1 of 2)

Commitment	Revision	Comments
RG 1.8	3	Not applicable for GEH QA Program
RG 1.21	1	Not applicable for GEH QA Program
RG 1.26	3	Except for the alternate Quality Group Classification for the Hydraulic Control Unit per Note 8 of Table 3.6-2
RG 1.28	3	Except for NRC-accepted alternate positions in Table 2-1 of Reference 17.0-1
RG 1.29	3	Except for Main Steam Piping from seismic interface restraint to turbine stop valves as identified in Table 3.6-2 and Figure 3.2-1
RG 1.30	0	No exception
RG 1.33	2	Not applicable for GEH QA Program
RG 1.37	0	Except for NRC-accepted alternate positions in Table 2-1 of Reference 17.0-1
RG 1.38	2	Except for NRC-accepted alternate positions in Table 2-1 of Reference 17.0-1
RG 1.39	2	No exception
RG 1.54	1	No exception
RG 1.58	Withdrawn	Superseded by RG 1.28, Rev. 3
RG 1.64	Withdrawn	Superseded by RG 1.28, Rev. 3, except for NRC-accepted alternate positions in Table 2-1 of Reference 17.0-1
RG 1.74	Withdrawn	Superseded by RG 1.28, Rev. 3
RG 1.88	Withdrawn	Superseded by RG 1.28, Rev. 3
RG 1.94	1	Not applicable for GEH QA Program
RG 1.97	4	No exception
RG 1.116	0-R	No exception
RG 1.123	Withdrawn	Superseded by RG 1.28, Rev. 3
RG 1.143	2	No exception
RG 1.144	Withdrawn	Superseded by RG 1.28, Rev. 3
RG 1.146	Withdrawn	Superseded by RG 1.28, Rev. 3
RG 1.152	2	No exception
RG 1.168	1	No exception
RG 1.169	0	No exception
RG 1.170	0	No exception
RG 1.171	0	No exception
RG 1.172	0	No exception
RG 1.173	0	No exception
RG 1.176	0	Not applicable for GEH QA Program

Table 17.0-1 Compliance With Quality Assurance Program Commitments (Sheet 2 of 2)

Commitment	Revision	Comments
RG 4.15	1	No exception
RG 7.10	2	No exception
Subpart 2.1 of ASME NQA-1-1994	1994	Met by ESBWR commitment to ASME NQA-2-1983
Subpart 2.2 of ASME NQA-1-1994	1994	Met by ESBWR commitment to ASME NQA-2-1983
Subpart 2.4 of ASME NQA-1-1994	1994	Met by ESBWR commitment to IEEE 336-1985
Subpart 2.5 of ASME NQA-1-1994	1994	Met by ESBWR commitment to ASME NQA-2-1983
Subpart 2.7 of ASME NQA-1-1994	1994	No exception
Subpart 2.8 of ASME NQA-1-1994	1994	Met by ESBWR commitment to ASME NQA-2-1983
Subpart 2.15 of ASME NQA-1-1994	1994	Met by ESBWR commitment to ASME NQA-2-1983
Subpart 2.20 of ASME NQA-1-1994	1994	Met by ESBWR commitment to ASME NQA-2-1983
RG 1.189, Regulatory Position 1.7 “Quality Assurance”	0	No exception
NRC Generic Letter 85-06	1985	No exception
NRC Generic Letter 89-02	1989	No exception
NRC Generic Letter 91-05	1991	Not applicable for GEH QA Program
Regulatory Position 3.5 and Appendix A of RG 1.155	0	No exception
Nuclear Information and Records Management Association, Inc. (NIRMA) TG 11-1998	1998	No exception
NIRMA TG 15-1998	1998	No exception
NIRMA TG 16-1998	1998	No exception
NIRMA TG 21-1998	1998	No exception

17.1 Quality Assurance During Design

The QA Program described in Section 17.1 is applicable to the ESBWR design activities supporting the standard design certification. Quality assurance is the responsibility of the DCD applicant for these design activities. The QA Program for design activities related to a specific plant is defined in Section 17.2.

QA applied during COL application preparation and site specific design activities is addressed in Section 17.5.

17.1.1 Organization

"G E Nuclear Energy QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 1, establishes requirements for the Organization structure used during design of the ESBWR.

17.1.2 Quality Assurance Program

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 2, establishes requirements for the Quality Assurance Program used during design of the ESBWR.

The identification of safety-related structures, systems and components to be controlled by the GEH QA Program is shown in Table 3.6-2.

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 2, establishes a 10 CFR Part 21 notification and posting system which is procedurally controlled. The requirement of 10 CFR Part 21 is imposed on all safety-related purchase documents.

17.1.3 Design Control and Verification

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 3, establishes requirements for Design Control used during design of ESBWR. Minimum design requirements are identified in Table 3.2-2.

*ESBWR - Software Quality Assurance Program Manual, (*Reference 17.1-2*), establishes the requirements for Software Verification and Validation Quality Controls. Software Design Verification and Validation is discussed in Subsection 7.8.2.1 and Appendix 7B.*

17.1.4 Procurement Document Control

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 4, establishes requirements for Procurement Document Control used during design of the ESBWR.

17.1.5 Instructions, Procedures, and Drawings

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 5, establishes requirements for Instructions, Procedures, and Drawings used during design of the ESBWR.

17.1.6 **Document Control**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 6, establishes requirements for Document Control used during design of the ESBWR.

17.1.7 **Control of Purchased Material, Equipment, and Services**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 7, establishes requirements for Control of Purchased Material, Equipment, and Services used during design of the ESBWR. GEH has procedurally established a Commercial Grade dedication program, which meets the requirements of 10 CFR Part 21.

17.1.8 **Identification and Control of Materials, Parts, and Components**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 8, establishes requirements for Identification and Control of Materials, Parts, and Components during design of the ESBWR.

17.1.9 **Control of Special Processes**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 9, establishes requirements for Control of Special Processes used during design of the ESBWR.

17.1.10 **Inspection**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 10, establishes requirements for Inspection used during design of the ESBWR.

17.1.11 **Test Control**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 11, establishes requirements for Test Control used during design of the ESBWR.

17.1.12 **Control of Measuring and Test Equipment**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 12, establishes requirements for Control of Measuring and Test Equipment during design of the ESBWR.

17.1.13 **Handling, Storage and Shipping**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 13, establishes requirements for Handling, Storage, and Shipping used during design of the ESBWR.

17.1.14 **Inspection, Test, and Operating Status**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 14, establishes the control of Inspection, Test, and Operating Status used during design of the ESBWR.

17.1.15 **Nonconforming Materials, Parts, or Components**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 15, establishes requirements for the control of Nonconforming Materials, Parts, or Components used during design of ESBWR.

17.1.16 **Corrective Action**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 16, establishes requirements for the Corrective Action program used during design of the ESBWR.

17.1.17 **Quality Assurance Records**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 17, establishes requirements for control of Quality Assurance Records used during design of the ESBWR.

17.1.18 **Audits**

"GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 18, establishes requirements for a comprehensive system of QA Audits used during design of the ESBWR.

17.1.19 **Training and Qualification Criteria – Quality Assurance**

In accordance with "GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 2, Training and Qualification of QA personnel is procedurally established and maintained.

17.1.20 **Training and Qualification – Inspection and Test**

In accordance with "GENE QA Program Description," NEDO-11209-04A (Reference 17.1-1) Section 2, Training and Qualification of Inspection and Test personnel is procedurally established and maintained.

17.1.21 **QA Program Commitments**

Regulatory Guides and Standards and their respective revisions, including exceptions, alternatives and clarifications are addressed in the appropriate UFSAR sections and in Table 17.0-1.

17.1.22 **Nonsafety-Related SSC Quality Controls**

Nonsafety-related Structure, System and Components (SSCs) that perform safety significant functions have QA requirements applied commensurate with the importance of the item's function. The identification of nonsafety-related structures, systems and components is shown in Table 3.6-2. Reference 17.1-3 describes the QA requirements that are applied to nonsafety-related SSCs.

17.1.23 **Independent Review**

Not applicable for GEH QA Program.

17.1.24 **COL Information**

None.

17.1.25 **References**

17.1-1 GE Nuclear Energy, “GE Nuclear Energy Quality Assurance Program Description,” NEDO-11209-04A, Revision 8, March 1989.

17.1-2 *GE Hitachi Nuclear Energy, “ESBWR - Software Quality Assurance Program Manual,” NEDE-33245P, Class III (Proprietary), Revision 5, February 2010, and NEDO-33245, Class I (Non-proprietary), Revision 5, February 2010.*

17.1-3 GE Hitachi Nuclear Energy, “NP-2010 COL Demonstration Project Quality Assurance Program,” NEDO-33181, Revision 6, August 2009.

17.2 Quality Assurance During Construction and Operations

The licensee's Quality Assurance Program in place during the construction and operations phases, including adapting the design to specific plant implementation, is described in Section 17.5.

17.2.1 COL Information

17.2-1-A QA Program for the Construction and Operations Phases

This COL Item is addressed in Section 17.2.

17.2-2-A QA Program for Design Activities

This COL Item is addressed in Section 17.2.

17.2.2 References

None.

17.3 Quality Assurance Program Description

The Quality Assurance Program Document applicable to the licensee is described in Section 17.5. The QAPD applied by the Design Team during the design certification phase is described in Section 17.1.

17.3.1 COL Information

17.3-1-A Quality Assurance Program Document

This COL Item is addressed in Section 17.3.

17.3.2 References

None.

17.4 Reliability Assurance Program During Design Phase

This section presents the ESBWR Design Reliability Assurance Program (D-RAP).

17.4.1 Introduction

The GEH ESBWR D-RAP is a program utilized during detailed design and specific equipment selection phases to assure that the important ESBWR reliability assumptions of the Probabilistic Risk Assessment (PRA) are considered throughout the plant life. The PRA is used to evaluate the plant response to initiating events and mitigation to ensure potential plant damage scenarios pose a very low risk to the public.

The D-RAP identifies relevant aspects of plant operation, maintenance, and performance monitoring of important plant SSCs for owner/operator consideration in assuring safety of the equipment and limiting risk to the public. An example is provided in Subsection 17.4.11 to demonstrate how the D-RAP applies to the Isolation Condenser System (ICS). The ICS example shows how the principles of D-RAP are applied to other systems identified by the PRA as being risk-significant.

There are no site specific SSCs within the scope of the Reliability Assurance Program (RAP). The quality elements for all SSCs within the scope of the Design Reliability Assurance Program (D-RAP) are in accordance with the Quality Assurance Program Description (QAPD).

The objectives of reliability assurance during the operations phase are integrated into the Quality Assurance Program (Section 17.5), the Maintenance Rule (MR) Program (Section 17.6), and other operational programs. Specific reliability assurance activities are addressed within operational programs (e.g., maintenance rule, surveillance testing, inservice testing, inservice inspection, and quality assurance) and the maintenance programs.

The MR Program incorporates the following aspects of operational reliability assurance (refer to Section 17.6):

- Use of PRA importance measures, the expert panel process, and deterministic methods to determine the list of risk-significant SSCs.
- Evaluation and maintenance of the reliability of SSCs in the scope of the D-RAP.
- Monitoring the effectiveness of maintenance activities needed for operational reliability assurance.
- Classifying, initially, as high-safety-significant, all SSCs that are in the scope of the D-RAP, or applying expert panel review for any exceptions.
- Use of historical data and industry operating experience on equipment performance as available.
- Use of specific criteria to establish the level of performance or condition being maintained for SSCs within the scope of the MR Program; and use of monitoring to identify declining trends

between surveillances and to minimize the likelihood of undetected performance or condition degradation to unacceptable levels, to the extent possible.

- Use of maintenance programs to determine the nature and frequency of maintenance activities to be performed on plant equipment, including SSCs within the scope of the MR Program.

17.4.2 **Scope**

The scope of the ESBWR D-RAP includes all RTNSS SSCs and risk-significant SSCs, both safety-related and nonsafety-related, that provide defense-in-depth or result in significant improvement in the PRA evaluations.

A preliminary list of risk-significant SSCs within the scope of the D-RAP is developed in the design phase.

The list is updated, using a blended approach and an Expert Panel when plant-specific information is available. This updated list forms part of the basis for the HSS category, as described in NUMARC 93-01, and as endorsed by RG 1.160, of the SSCs within the scope of the Maintenance Rule program, as prescribed by 10 CFR 50.65(b). The Maintenance Rule Program ensures that risk-significant SSCs operate throughout plant life with reliable performance that is consistent with the PRA. The HSS category within the Maintenance Rule Program scope must encompass the SSCs in the RAP scope as modified for the operations phase if the Maintenance Rule Program is to be used along with the QA and maintenance and surveillance programs in implementation of the RAP in the operations phase. The PRA for the ESBWR, and other sources, such as historical records of Boiling Water Reactor (BWR) system and components are used to identify and prioritize those SSCs that are important to prevent or mitigate plant anticipated operational occurrences (AOOs) or other events that could present a risk to the public.

Nonsafety-related SSCs within the scope of Regulatory Treatment of Nonsafety Systems (RTNSS) (Section 19A) are included in the scope of D-RAP and have graded quality assurance controls (Reference 17.4-8).

17.4.3 **Purpose**

The purpose of the D-RAP is to ensure that the plant safety, as estimated by the PRA, is maintained as the detailed design evolves through the implementation and procurement phases, and that pertinent information is provided in the design documentation to the future owner/operator so that equipment reliability, as it affects plant safety, is maintained through operation and maintenance during the entire plant life.

17.4.4 **Objective**

The objective of the D-RAP is to identify those plant SSCs that are significant contributors to risk, as shown by the PRA or other sources, and to assure that, during the implementation phase, the plant design continues to utilize risk-significant SSCs whose reliability is commensurate with the PRA

assumptions. Reliability includes ensuring that SSCs in the scope of D-RAP do not degrade to an unacceptable level during plant operations, and that the frequency of initiating events posing challenges to these SSCs is minimized. The D-RAP also identifies key assumptions regarding any operation, maintenance and monitoring activities that the owner/operator should consider in implementing operational reliability assurance activities to assure that such SSCs function when challenged throughout plant life with reliability consistent with that assumed in the PRA.

17.4.5 **GEH Organization for D-RAP**

The GEH ESBWR Engineering section is an integrated design and engineering organization that is responsible for formulating and implementing the D-RAP. The Manager, ESBWR Engineering is responsible for the design and licensing of the ESBWR, and for development of the D-RAP.

The ESBWR Engineering organization is responsible for the design analysis and PRA engineering that is necessary to support the development of the D-RAP. PRA personnel are directly involved with the design organization and keep the design staff cognizant of risk-significant items, program needs, and project status. PRA personnel participate in the design change control process, which includes providing D-RAP related inputs in the design process.

GEH ESBWR Engineering design procedural controls are applied to the D-RAP. Specific procedures provide guidance on the design process, control of design changes, and storage and retrieval controls.

The design control procedure defines the process for performing, documenting, and verifying design activities. This includes developing or modifying the design of systems, engineering evaluations, analyses, calculations and documents, (e.g., specifications, drawings, reports).

The procedure for design change control defines the process for evaluating design changes in engineering controlled documents to ensure that the total effect is considered before a change is approved, and that the affected documents are identified and changed accordingly. The procedure identifies interfaces and organizations responsible for these interfaces, including PRA review. If a proposed change could affect the safety, availability or capacity factor of the ESBWR plant, system reliability is analyzed.

Several design control procedures provide guidance for developing a high quality process for reliability assurance. The documentation procedure establishes the requirements and responsibilities for the preparation, approval, and issue of documents controlled by the engineering design organizations. The quality assurance records procedure provides requirements for quality assurance record retention. The self-assessment, corrective action and audits procedure specifies the responsibilities for performing self-assessments; internal audits of the engineering organization, and prompt identification, documentation, and corrective actions on conditions that are adverse to quality.

In addition to the standard engineering design processes and quality controls, specific guidance is used to define and implement an effective RAP. Reference 17.4-1 describes the D-RAP processes for identifying and prioritizing risk significance, implementing reliability assurance strategies, and monitoring program effectiveness.

17.4.6 **SSC Identification/Prioritization**

A list of risk-significant SSCs is developed and controlled as a topical report (Reference 17.4-7). The preliminary list is based on the results of the generic PRA. The list is updated when the plant-specific PRA is developed. At this point, a blended approach is used for identifying and prioritizing risk significant SSCs. This approach combines the various PRA analytical results with operating experience and an expert panel process to develop a comprehensive risk analysis.

The Level 1 PRA is used to evaluate accident sequences from initiating events and failures of safety functions that lead to core damage. An assessment is performed for operating and shutdown conditions. The external events analysis considers events whose cause is external to systems associated with normal plant operations, including internal flooding, fire, high winds, and seismic events. The seismic events are analyzed using a seismic margins approach that provides qualitative conclusions on the ability of ESBWR SSCs to cope with seismic events. The other external events are quantified using the Level 1 PRA.

Level 1 basic events representing component failures are identified as risk-significant if their importance values for Risk Achievement Worth (RAW) are greater than or equal to 5.0, or Fussell-Vesely Importance are greater than or equal to 0.01.

Level 2 risk significance is determined by identifying the dominant contributors to severe accidents and offsite release of fission products. This qualitative analysis, which is performed by the expert panel, includes the evaluation of severe accident phenomena and fission product source terms, and containment integrity strategies including pressure suppression, decay heat removal, and hydrogen generation.

SSC functions relied upon under power-operating and shutdown conditions to meet the NRC's safety goal guidelines of a Core Damage Frequency (CDF) of less than 1.0E-4 per reactor year and Large Release Frequency of less than 1.0E-6 per reactor year are risk-significant. SSC functions needed to meet the containment performance goal, including containment bypass, during severe accidents are also risk-significant.

Operating experience identifies previous failures of components in similar applications, and also reveals situations where inappropriate human actions have led to functional failures of SSCs. The expert panel assesses component operating history and industry operating experience when it can be applied to assessing risk significance.

Safety-related SSCs are controlled by plant Technical Specifications. If a nonsafety-related SSC is shown through operating experience or PRA to be significant to public health and safety, then it

should be controlled by Technical Specifications. In this case, “significant” equates to an SSC that is required to meet the NRC Safety Goals. If it is determined that an SSC is risk significant, but is not required for meeting the NRC Safety Goals, then performance controls should be implemented through the RAP. If the SSC is not significant, then normal controls would be implemented through the site Maintenance Rule and corrective action programs.

The list of risk-significant SSCs will be confirmed via ITAAC (see Tier 1 Table 3.6-1).

17.4.7 **Design Considerations**

The reliability of SSCs in the scope of D-RAP, which are identified by the PRA and other sources, are evaluated at the detailed design stage by appropriate design reviews and reliability analyses. The procedure for design change control defines the process for evaluating design changes in engineering controlled documents to ensure that the total effect is considered before a change is approved, and the affected documents are identified and changed accordingly.

A design reliability assessment is a process in which the design engineer builds quality and reliability into the SSC, while ensuring that the basis for SSC design is properly modeled in the PRA. Due to the preliminary nature of the PRA model during the design phase, the model relies on generic information, bounding assumptions, or design requirements as a basis for model development. This design assessment can be performed for changes that occur during the plant design phase, as well as during normal plant operations. It is a systematic method to evaluate the proposed design details with respect to PRA insights. The assessment considers reliability concepts, such as redundancy, diversity, human factors, spatial interactions, and external events to enhance the system design, and considers PRA insights and assumptions. If the assessment reveals that the proposed design could conflict with results and insights calculated in the PRA, or could cause significant unavailability of a safety function, then a design change is pursued.

Proposed design changes are processed by the design change control procedure, which requires PRA review. If a design change affects the PRA model, then the PRA is revised in accordance with the PRA update process described in the PRA procedure.

17.4.8 **Defining Failure Modes**

The determination of dominant failure modes of SSCs in the scope of D-RAP includes historical information, analytical models and existing requirements. Many BWR systems and components have compiled a significant historical record, so an evaluation of that record is performed. For those SSCs for which there is not an adequate historical basis to identify critical failure modes, an analytical approach is necessary.

Inputs may include PRA importance analysis, root cause analysis, failure modes and effects analysis, and review of operating experience. In addition, equipment performance information, including vendor manuals, ASME Section XI, technical specifications, RTNSS, and other regulatory requirements are reviewed to identify important safety functions.

The design engineer analyzes this information to identify dominant failure modes, such as single failures, latent failures not detected by routine monitoring, common cause failures, or failures that could cascade into more significant safety functional failures.

17.4.9 **Operational Reliability Assurance Activities**

Once the dominant failure modes are determined for SSCs in the scope of D-RAP, an assessment is performed to identify operational reliability assurance activities that assure acceptable performance during plant life. Such activities may consist of periodic surveillance inspections or tests, monitoring of SSC performance, or periodic preventive maintenance. Some SSCs may require a combination of activities to assure that their performance is consistent with that assumed in the PRA.

Refer to Section 17.4.1 for the implementation of reliability assurance during the operations phase.

Periodic testing of SSCs may include startup of standby systems, surveillance testing of instrument circuits to assure that they respond to appropriate signals, and inspection of SSCs (such as tanks and pipes) to show that they are available to perform as designed. Performance monitoring, including condition monitoring, can consist of measurement of output (such as pump flow rate or heat exchanger temperatures), measurement of magnitude of an important variable (such as vibration or temperature), and testing for abnormal conditions (such as oil degradation or local hot spots).

Periodic preventive maintenance is an activity performed at regular intervals to preclude problems that could occur before the next preventive maintenance interval. This could be regular oil changes, replacement of seals and gaskets, or refurbishment of equipment subject to wear or age related degradation.

Planned maintenance activities are integrated with the regular operating plans so that they do not disrupt normal operation. Maintenance that is performed more frequently than refueling outages is planned so as to not disrupt operation or be likely to cause reactor scram, engineered safety feature actuation or AOOs. Maintenance planned for performance during refueling outages is conducted in such a way that it has little or no effect on plant safety, outage length or other maintenance work.

Reliability monitoring information is collected from sources such as Technical Specification surveillance test data and industry operating data, if applicable. Similar reliability data is collected for RTNSS SSCs, which are within the scope of the D-RAP. Reliability estimates are also developed from basic event fault trees for risk-significant (i.e., HSS) systems and components modeled in ESBWR PRA.

17.4.10 **Owner/Operator's Reliability Assurance Program**

Operational reliability assurance activities are implemented by the ESBWR owner/operator, and use the information provided by GEH. Elements include:

- **Problem Prioritization:** Identification for each of the risk-significant SSCs of the importance of that item as a contributor to its system unavailability and assignment of priorities to problems that are detected with such equipment.
- **Corrective Action Implementation:** Carrying out identified corrective action on risk-significant equipment to restore equipment to its intended function in such a way that plant safety is not compromised during work.
- **Plant Aging:** Some of the risk-significant equipment is expected to undergo age related degradation and require equipment replacement or refurbishment.
- **Programmatic Interfaces:** Reliability assurance interfaces related to the work of the several organizations and personnel groups working on risk-significant SSCs.
- **MR Program:** The MR Program is described in Section 17.6.

Plant operational reliability assurance activities address the interfaces with construction, startup testing, operations, maintenance, engineering, safety, licensing, quality assurance and procurement of initial and replacement equipment. Refer to Section 17.4.1 for the implementation of reliability assurance activities.

17.4.11 D-RAP Implementation – Example Case

The following example case is provided to illustrate the D-RAP process. It is based upon design and PRA details of the ICS that were available at a particular time during the design phase. As such, it is not intended to be updated if design or PRA details of the ICS change.

17.4.11.1 System Description

The ICS is used as an example to demonstrate how the reliability assurance processes are used to identify, analyze, and develop effective reliability assurance strategies. ICS is a safety-related system that removes reactor decay heat following events involving reactor shutdown and containment isolation. It also prevents unnecessary reactor depressurization, and precludes the need for operation of other Engineered Safety Features to bring the reactor to a safe and stable condition. In the event of a loss-of-coolant-accident (LOCA), ICS provides additional liquid inventory by opening the condensate return valves to actuate the system. ICS also assists with initial depressurization of the reactor before Automatic Depressurization System (ADS) in event of loss of feedwater, so that the automatic depressurization can take place from a lower pressure.

The ICS consists of four totally independent trains, each containing an isolation condenser that condenses steam on the tube side and transfers heat to the Isolation Condenser/Passive Containment Cooling System (IC/PCCS) pool, which is vented to the atmosphere. The isolation condensers are connected by piping to the Reactor Pressure Vessel (RPV), and are placed at an elevation above the source of steam (i.e., vessel). When the steam is condensed, the condensate is returned to the vessel via a condensate return line. A detailed description of ICS is located in Subsection 5.4.6.

The major differences between the ESBWR ICS and the conventional BWR ICS are:

- Use of four heat exchangers instead of one or two in conventional BWRs.
- Parallel path for condensate return to the vessel instead of single injection path.
- Use of both nitrogen-operated and motor-operated valves for condensate return instead of only motor-operated valves.
- Use of large cooling pools instead of shell-side heat exchangers.

The design features of the ESBWR ICS contain significant improvements in reliability and availability that are risk-based. The number of heat exchangers is increased for redundancy. The condensate return line to the vessel has two paths for success and each path uses a diverse isolation valve. The large capacity isolation condenser pools provide cooling capacity for 72 hours following a reactor scram. Conventional BWRs typically have 20 to 30 minutes of cooling water capacity.

17.4.11.2 **Identifying Risk Information**

In order to examine the relative importance or dominance of failures of ICS components, a fault tree has been developed with the top gate defined as failure of the ICS to inject water into the RPV upon demand. This tree considers the worst-case scenario with respect to AOOs and accidents, which involves a success criterion that three-of-four ICS subsystems must function. This requires a condensate return path and a vent path for non-condensables for each functioning subsystem. This fault tree is quantified to identify the relative importance of ICS components as they contribute to system unreliability.

A risk ranking of the ICS basic events has been performed to identify SSCs with the greatest importance. The ranking is performed using the ICS top event model, described above. In addition, a risk ranking is performed using the CDF top event (PRA) model to provide further perspective on the importance of ICS components. The results of the risk rankings are provided in Table 17.4-1.

17.4.11.3 **Failure Mode Identification**

The importance analysis results indicate that no single SSC has a dominant effect on ICS system unavailability. Therefore, the design and selection of ICS components appears to be reasonable.

The dominant failures, as shown in Table 17.4-1, involve valves. Operating experience indicates that valves, in general, are subject to mechanical problems such as valve stem failure, separation of stem from disk, and failure to stroke. In addition, remote actuated valves can experience actuator failures, electrical failures in the motor winding or motor internals, and problem with torque limit switches and switch settings.

For ICS, the dominant failures involve the condensate return nitrogen-operated isolation valves (B32-F006A, B, C, D). The parallel condensate return valves, B32-F005A, B, C, D have lower risk importance values and are thus not considered to be dominant failures.

According to the design specifications, the condensate return valve, (F006) is a spring-loaded, pneumatic, piston-operated globe valve, designed to fail open on loss of pneumatic pressure to the valve actuator. This valve is also signaled to open when reactor water level drops to Level 2. A pneumatic accumulator is located close to the valve to provide pneumatic pressure for the purpose of assisting in valve closure when both pilots are energized or in the event of failure of pneumatic supply pressure to the valve operator. Examples of the types of failure that could affect valve reliability are shown in Table 17.4-2.

17.4.11.4 Identification of Maintenance Requirements

Maintenance activities are developed to assure that the dominant failure modes are reduced, or kept to an acceptably low probability. The types of maintenance and the maintenance frequencies are both important aspects of ensuring that the equipment failure rate is consistent with that assumed in the PRA model. The designer considers periodic or condition-based testing and maintenance activities to keep the unreliability to an acceptable level.

In this example, the D-RAP analytical process results in a preliminary recommendation for quarterly valve testing of the B32-F006 valves, along with flow testing during each refueling outage. This helps to preserve the unreliability values used in the PRA model. In addition, the B32-F005 valves, which are in the parallel path, are recommended to receive the same testing requirements. This will ensure that these valves do not experience degraded performance that could increase their risk significance.

The recommended maintenance activities and performance monitoring will be governed by the QA and Maintenance Rule Program.

17.4.12 Glossary of Terms

Design Reliability Assurance Program — Performed by the plant designer to assure the plant is designed so that it can be operated and maintained in such a way that the reliability assumptions of the probabilistic risk assessment apply throughout plant life.

Fussell-Vesely Importance — A measure of the component contribution to CDF. Numerically, the percentage contribution of the component to CDF.

Owner/Operator — The utility or other organization that owns and operates the ESBWR following construction.

Operational Reliability Assurance Program — Performed by the plant owner/operator to assure the plant is operated and maintained safely and in such a way that the reliability assumptions of the PRA apply throughout plant life.

Regulatory Treatment of Non-Safety Systems (RTNSS) — A process to determine whether regulatory oversight for certain nonsafety-related systems is needed, and to determine an appropriate level of regulatory oversight commensurate with their risk significance.

Risk-Significant — Those structures, systems, or components that are identified as contributing significantly to the CDF.

17.4.13 COL Information

17.4-1-A Identifying Site-Specific SSCs Within the Scope of the RAP

This COL Item is addressed in Section 17.4.1 and Section 17.4.6.

17.4-2-A Operation Reliability Assurance Activities

This COL Item is addressed in Section 17.4.1, Section 17.4.6, Section 17.4.9, Section 17.4.10, and Section 17.6.

17.4.14 References

17.4-1 GE Energy Nuclear, “ESBWR Reliability Assurance Program,” NEDO-33289, Revision 2, September 2008.

17.4-2 US Nuclear Regulatory Commission, “Policy and Technical Issues Associated With the Regulatory Treatment of Non-Safety Systems (RTNSS) in Passive Plant Designs (SECY-94-084),” SECY-95-132, May 1995.

17.4-3 US Nuclear Regulatory Commission, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” Regulatory Guide 1.160, March 1997.

17.4-4 US Nuclear Regulatory Commission, “Assessing and Managing the Risk Before Maintenance at Nuclear Power Plants,” Regulatory Guide 1.182, May 2000.

17.4-5 NEI, “Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” NUMARC 93-01 April 1996.

17.4-6 NEI, “Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” NUMARC 93-01, Section 11, February 22, 2000.

17.4-7 GE Hitachi Nuclear Energy, “Risk Significance of Structures, Systems and Components for the Design Phase of the ESBWR,” NEDO-33411, Revision 2, February 2010.

17.4-8 GE Hitachi Nuclear Energy, “NP-2010 COL Demonstration Project Quality Assurance Program,” NEDO-33181, Revision 6, August 2009.

Table 17.4-1 D-RAP Example Case - ICS Importance Analysis

Component	Description	Fussell-Vesely Importance	Risk Achievement Worth
B32-F006B	Air Operated Valve F006B Fails To Open	8.27E-04	1.41
B32-F006C	Air Operated Valve F006C Fails To Open	8.27E-04	1.41
B32-F006D	Air Operated Valve F006D Fails To Open	8.27E-04	1.41
B32-F006A	Air Operated Valve F006A Fails To Open	1.04E-04	1.05

Table 17.4-2 D-RAP Example Case - ICS Failure Modes and Reliability Strategy

Component	Failure Mode	Cause	Reliability Strategy
B32-F006A, B, C, D	Failure to Open due to mechanical problems	Binding, fatigue failure, foreign material	Inspect Valve Internals, System Flow Test, Valve Stroke Test
	Failure to Open due to electrical problems with valve operator	Windings, Wiring, Relays, Contacts	Logic System Functional Test, Valve Stroke Test

17.5 Quality Assurance Program Description – Design Certification, Early Site Permits, and New License Applicants

HISTORICAL QA applied to the DC activities is described in Section 17.1. ESP QA is not applicable to Fermi 3.

In early 2007, Detroit Edison initiated a project to prepare a Combined License Application (COLA) for a potential new unit to be located at the site of the company's existing Fermi 2 nuclear power plant. The project was a corporate initiative and was conducted independent of Fermi 2 so as not to be a distraction and to minimize the burden on the plant organization and infrastructure. As such, the project was initiated independent of the Fermi 2 Quality Assurance (QA) program. Initially, the COLA project was to be conducted as essentially a turnkey project, using a primary COLA contractor with minimal Detroit Edison staff. The objective for the project was to prepare and submit a COLA prior to December 31, 2008, corresponding to the initial tax credit qualifying milestone from the Energy Policy Act of 2005. The COLA would be categorized as referencing a Certified Design without an Early Site Permit, for the purpose of defining the applicable guidance from Regulatory Guide 1.206 (DG-1145).

Development of COLA Work Product (January 2007 to November 2007)

The first objective of the project was to select a COLA contractor who would establish and execute 10 CFR 50 Appendix B requirements and prepare the COLA. Detroit Edison fully recognized that information developed in the preparation of a COLA, most significantly the site investigation activities, would subsequently be used to support the design of safety related structures, systems, and components, and needed to be conducted in a quality manner. Accordingly, a request for proposal to perform all activities necessary to prepare a COLA and establish and execute a QA program for the COLA project was prepared. The request for proposal required all bidders to establish that they had the prerequisite 10 CFR 50 Appendix B QA program and to describe how their Appendix B QA program was to be applied to the Fermi 3 COLA development project. Requests for proposal were solicited only from potential contractors who were established in the nuclear services business, and who were currently executing comparable projects for other potential applicants.

In February 2007, Detroit Edison received several proposals in response to the request for solicitation. Black & Veatch, headquartered in Overland Park, Kansas and hereafter simply identified as B&V, provided a detailed proposal in response. Detroit Edison based its selection on a review of the submitted proposal including, but not limited to, the following attributes:

1. Knowledge that B&V's 10 CFR 50 Appendix B/NQA-1 QA program was being properly implemented based on reporting of independent reviews by other NRC approved 10 CFR 50 Appendix B programs such as Entergy, American Electric Power and Nebraska Public Power District in the proposal.

2. B&V was leading the development of Entergy's River Bend COLA.

In April 2007, Detroit Edison established a contract with B&V for the development of the COLA. The procurement controls documented within the COLA contract included:

1. Scope of work to be performed by B&V,
2. Technical requirements for the prepared COLA in accordance with 10 CFR 52, 10 CFR 51, 10 CFR 50, 10 CFR 20, NUREG-0800, NUREG-1555, Reg. Guide 1.206 (DG-1145), etc.,
3. Acceptance requirements and control measures for Detroit Edison's evaluation of COLA and intermediary work product developed by B&V,
4. Organizational responsibilities (including reporting and communication methods), 10 CFR 50 Appendix B/NQA-1 requirements, and 10 CFR 50 Appendix B/NQA-1 applicability to FSAR Chapters 2 through 9, 14, 15, 16, 18 and 20, the geotechnical site boring program, radiological analyses, and meteorological analyses associated with the radiological analyses,
5. Access to B&V's facilities and records for inspection or audit by Detroit Edison,
6. Identification of the documentation requirements and dates of submission required by Detroit Edison, and
7. Requirements for reporting and disposition of non-conformances in accordance with 10 CFR 21.

The requirements necessary to assure adequate quality were incorporated by reference in the documents for procurement, i.e. the "Contract" and the "Proposal" for COLA preparation activities and a QA program satisfying the requirements of 10 CFR 50 Appendix B for the COLA development was established. Detroit Edison through contract, delegated the work of establishing and executing the QA program to B&V for COLA development related activities.

In March 2007, B&V, in establishing and executing a QA program, issued a Project Management Memorandum for "Detroit Edison (Fermi Site) COL Application Preparation" (PMM Phase I), Rev. 0. PMM Phase I identified to Detroit Edison and all team members (including subcontractors) the scope of the project, means of correspondence, document control requirements, project specific quality assurance requirements, training requirements, applicable procedures, and applicable codes and standards.

PMM Phase I, Rev. 0, identified those quality attributes required of the geotechnical subcontractor execution practices and quality assurance programs that required oversight and acceptance by B&V prior to and during execution of work scope to support COLA development. Attachment C-2, "Geotechnical Subcontractor Quality Oversight" identified two key elements:

1. All field and laboratory activities would be performed under the auspices of the B&V 10 CFR 50 Appendix B/NQA-1 QA program. B&V Nuclear Quality Assurance, part of Black & Veatch Overland Park, Kansas, would perform a series of pre-work surveillance and/or audit

activities as well as periodic in-process surveillance and/or audit activities to verify the geotechnical activities performed by these subcontractors were of sufficient quality to support the analysis for a COL application.

2. Oversight activities would be performed by B&V Nuclear Quality Assurance, geotechnical, engineering and/or field oversight personnel. The initial vendor oversight activities would be performed at the contractor's primary laboratory/staging office for the Fermi COL Project scope of work by both B&V Nuclear Quality Assurance and geotechnical representatives prior to commencement of related work activities. Project execution oversight activities would be performed at the jobsite and in the laboratory by B&V Nuclear Quality Assurance, geotechnical, engineering, or field oversight personnel. B&V Nuclear Quality Assurance planned on performing a surveillance of the geotechnical field activities shortly after initiation of the geotechnical field investigation. Likewise, B&V Nuclear Quality Assurance planned for performing a surveillance/audit of the laboratory activities shortly after initiation of the laboratory scope of work. Subsequent B&V QA activities would be scheduled based on the results of the initial activities. Field activities would be performed under continuous observation by the B&V oversight representative and B&V geotechnical personnel with surveillance activities periodically documented to ensure compliance.

PMM Phase I, Rev. 0, specified in Attachment C, “Detroit Edison Fermi COL Project Quality Assurance Plan,” restated the applicability of the B&V 10 CFR 50 Appendix B/NQA-1 QA program to COLA activities consistent with the requirements of the COLA contract:

Activity	Nuclear Quality Assurance Program Applicability
FSAR Chapters 1, 10, 11, 12, 13, 17, and 19 development	Commercial quality program applies
FSAR Chapters 2, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, 18 and 20	Nuclear quality assurance program applies
Environmental Report	Commercial quality program applies
Hydrogeology Site Boring Program	Commercial quality program applies
Geotechnical Site Boring Program – on site and laboratory investigation and testing	Nuclear quality assurance program applies
Site Specific System Design (non-safety)	Commercial quality program applies
Radiological Analysis and Associated Meteorological Analysis (sub-contracted)	Nuclear quality assurance program applies

Activity	Nuclear Quality Assurance Program Applicability
Technical Advisory Board	Commercial quality program applies
Emergency Plan	Commercial quality program applies
Security Plan	Commercial quality program applies
DCD Departures if any	Commercial quality program applies unless safety-related
Site Redress Plan	Commercial quality program applies

Detailed information identifying COLA sections to which the requirements of 10 CFR 50 Appendix B were applied and activities that supported those sections to which the requirements of 10 CFR 50 Appendix B were applied is provided in Table 17.5-201.

Additionally, PMM Phase I, Rev. 0 identified the applicability of 10 CFR 50 Appendix B requirements to the various B&V subcontractors.

In April 2007, B&V arranged, as part of the 2006 annual internal audit, an independent audit of the B&V 10 CFR 50 Appendix B/NQA-1 QA program by a lead-auditor-qualified individual outside the B&V Overland Park office. The purpose of this independent audit was to evaluate the program's compliance with the 10 CFR 50 Appendix B quality requirements specified in Reg. Guide 1.28, Rev. 3. The audit team consisted of an audit team leader and three auditors supported by four technical specialists (mechanical engineering).

Also in April 2007, B&V Nuclear Quality Assurance conducted a commercial grade survey of PSI's Quality Program to evaluate commercial grade quality of activities controlled under the PSI Quality Program prior to beginning activities. Professional Services Industries (PSI's) test laboratory was approved to provide geotechnical laboratory services as a qualified commercial grade supplier. B&V Nuclear Quality Assurance also conducted a surveillance of Boart Longyear / Prosonic to evaluate activities controlled under Boart Longyear / Prosonic's quality control program document. B&V accepted Boart Longyear / Prosonic's quality control program upon satisfactory resolution of certain open items.

In May 2007, B&V began site hydrogeology investigation monitoring well construction. Core boring activities for geotechnical data collection, under the B&V 10 CFR 50 Appendix B/NQA-1 QA program, commenced upon completion of the monitoring well construction. These activities, as well as site geotechnical and other related activities by B&V and their various subcontractors, would continue through September 2007 (see Table 17.5-201 for dates of specific activities associated with B&V's development of FSAR Chapter 2). Also in May 2007, B&V Nuclear Quality Assurance conducted a surveillance of hydrogeology activities on the Fermi site. The surveillance reviewed drilling operations, sample control, procedural control of activities, record quality, and measuring and test equipment calibration. During this subsequent surveillance, B&V Nuclear Quality

Assurance reviewed the corrective actions associated with certain open items identified during B&V Nuclear Quality Assurance's initial review of the Boart Longyear / Prosonic's quality control program.

In June 2007 the Owner's Engineer (OE), Black &Veatch Ann Arbor (referred to as "OE, Black & Veatch Ann Arbor," throughout), observed B&V (Black & Veatch Overland Part referred to as "B&V" throughout) obtaining core samples at the Fermi site and reported to Nuclear Development the status of procedural compliance, ASTM standards availability, status of compliance with the Hydrogeology Data Collection Plan and the Geotechnical Data Collection Plan, that chain of custody processes were being followed, status of control of measurement and test equipment, and how corrective actions as a result of B&V Nuclear Quality Assurance surveillances were being handled.

Also in June 2007, B&V Nuclear Quality Assurance conducted a pre-work surveillance to evaluate GEOVision work activities associated with seismic testing and data collection. The surveillance found that the commercial grade quality and procedural processes for seismic testing and data collection at GEOVision were acceptable. B&V Nuclear Quality Assurance also conducted a pre-work surveillance to evaluate ARM Geophysics work activities associated with geotechnical testing of soil & bedrock. The surveillance found that the commercial grade quality and procedural processes for geotechnical testing of soil & bedrock at ARM Geophysics were acceptable.

In July 2007, B&V Nuclear Quality Assurance conducted a surveillance to evaluate Geomatrix work activities associated with geological, seismological, geophysical, and geotechnical characteristics of the Fermi site. The surveillance found that Geomatrix procedural requirements and technical capabilities were adequate to satisfy the requirements of PMM Phase I while working under the B&V 10 CFR 50 Appendix B/NQA-1 QA program.

In July 2007, B&V revised PMM Phase I to address the applicability of 10 CFR 50 Appendix B requirements to the geotechnical subcontractor and added two additional B&V subcontractors. The revised PMM Phase I reported that B&V Nuclear Quality Assurance had performed a pre-work surveillance inspection for each of the sub-surface investigation (geotechnical) sub-contractors, where necessary to support the implementation of 10 CFR 50 Appendix B. The pre-work surveillance would establish a baseline set of procedures from the B&V NP's and the sub-contractor procedures to meet the requirements of the B&V 10 CFR 50 Appendix B/NQA-1 QA program.

Also in July 2007 the OE, Black &Veatch Ann Arbor, observed B&V boring at the Fermi site and reported to Nuclear Development that on-site work was being performed under the B&V 10 CFR 50 Appendix B/NQA-1 QA program and that a copy was available for reference. It was also reported that work was being performed in accordance with the Hydrogeology Data Collection Plan and the Geotechnical Data Collection Plan and that copies of these documents were available, chain of

custody processes were being followed, and the status of compliance with ASTM standards, specifically ASTM D 5079-02(2006).

In August 2007, the OE, Black & Veatch Ann Arbor, observed B&V boring at the Fermi site and reported to Nuclear Development that on-site work was being performed under the B&V 10 CFR 50 Appendix B/NQA-1 QA program and that a copy was available for reference. It was also observed that work was being performed in accordance with the Hydrogeology Data Collection Plan and Geotechnical Data Collection Plan and that copies of these documents were available, that chain of custody processes were being followed, and how corrective actions as a result of B&V Nuclear Quality Assurance surveillances were being handled. Later in August, the OE, Black & Veatch Ann Arbor, observed B&V boring, split spoon sampling, and performing vacuum excavation at the Fermi site. The OE, Black & Veatch Ann Arbor, reported to Nuclear Development that on-site work was being performed under the B&V 10 CFR 50 Appendix B/NQA-1 QA program and that a controlled copy was available for reference. They also reported that work was being performed in accordance with the Hydrogeology Data Collection Plan, Hydrogeology Work Plan, and Geotechnical Data Collection Plan and that copies of these documents were available, that chain of custody processes were being followed, and that corrective actions associated with B&V corrective action program continued to be effective.

In September 2007 and during the conduct of geotechnical measurement activities on the Fermi site, B&V Nuclear Quality Assurance conducted a surveillance of testing activities, sample control, procedural control of activities, record quality, and measuring and test equipment calibration. This surveillance also included follow-up on the corrective actions associated with the issues identified during B&V Nuclear Quality Assurance's surveillance of hydrogeology activities on the Fermi site in May 2007. B&V Nuclear Quality Assurance also conducted a surveillance of PSI to verify implementation of the PSI Quality Program focusing on controls and testing activities. During the surveillance B&V Nuclear Quality Assurance observed work activities and reviewed documents and records. The surveillance found that technical and contractual requirements for geotechnical testing and data collection activities were effectively implemented. PSI Management personnel were interviewed and found to be cognizant of geotechnical and quality program expectations. The geotechnical work activities and responsibilities for custody of samples were evaluated as having been satisfactorily implemented in accordance with the governing specifications at the laboratory facility.

Beginning in March 2007 and through completion of the site investigations presented above, B&V commenced assembling the research, data, references, etc., necessary to support development of the COLA. Initial informational needs identified to Detroit Edison by B&V to support COLA development were provided. Subsequent informational needs from B&V or decisions from Detroit Edison needed by B&V were communicated using B&V's Request for Information process. The B&V Request for Information was then reviewed and accepted by the B&V 10 CFR 50 Appendix B/NQA 1 QA program as necessary.

In November 2007, PMM Phase I was revised to a) communicate to Detroit Edison and all team members that the COLA was to be based upon the ESBWR Certified Design and b) to update the project organization chart. PMM Phase I, Rev. 2 also communicated the addition of one B&V subcontractor. The revised PMM Phase I also identified that B&V Nuclear Quality Assurance had performed 1) a surveillance on the subsurface field activities by the B&V Nuclear Quality Assurance shortly after the initiation of the subsurface field investigation and again, during performance of the sub-surface downhole testing and 2) a surveillance/audit of the laboratory activities shortly after the initiation of the laboratory scope of work.

Receipt, Review and Acceptance of COLA Work Product (November 2007 to September 2008)

In November 2007, anticipating the activities necessary to receive, review and accept the COLA work product from B&V, Detroit Edison began to develop the necessary staffing to support the receipt, acceptance review, submittal, NRC review, and concurrent maintenance of the COLA. The increase in staffing also included the addition of an experienced QA professional. Subsequently, Nuclear Development staff drafted the Nuclear Development Quality Assurance Program Document (ND QAPD) and implementing procedures for those elements of the ND QAPD associated with the activities planned to be performed by Detroit Edison at the time (e.g., review of B&V COLA work product).

In January 2008, B&V Nuclear Quality Assurance conducted an audit to evaluate the B&V 10 CFR 50 Appendix B/NQA-1 QA program against the 10 CFR 50 Appendix B and NQA-1- 1994 quality requirements. The Nuclear Procurement Issues Committee (NUPIC) Audit Checklist was used to conduct the audit. The audit team consisted of an audit team leader and three auditors. The audit found that the B&V 10 CFR 50 Appendix B/NQA-1 QA program met the quality requirements of 10 CFR 50 Appendix B and NQA-1-1994 for the areas evaluated.

In February 2008, the Sr. VP Major Enterprise Projects approved for use the ND QAPD, which continued to delegate quality and safety-related services for COLA development to B&V in contract documents and implementing procedure NDP-NP-4.1, “Procurement of Services.” Subsequently, the implementing procedures were approved and the Nuclear Development staff was trained on the procedures necessary to review and accept the B&V developed COLA work products. Specifically, Nuclear Development implemented a procedure to complete the formal review of each chapter of the Fermi 3 COLA submitted by B&V’s Request for Review (RFR) process as a means to assure coordination and control of the finalization of the COLA. Comments generated during Detroit Edison’s review of the COLA work product against relevant regulatory guidance, information provided by Detroit Edison to B&V, and the Reference COLA (R-COLA), as applicable, were provided to B&V for resolution and incorporation. The Request for Review process required signoff by both the Detroit Edison reviewer and B&V for all comments.

From February 2008 through September 2008, Detroit Edison conducted COLA chapter reviews with final acceptance and submission of the COLA. Detroit Edison reviewed individual FSAR chapters or sections consistent with the interfaces established by PMM Phase I and the Nuclear Development procedure for review of COLA work products (see Table 17.5-201 for details on specific activities associated with Detroit Edison's review of FSAR chapters or sections).

In March 2008, a Nuclear Development QA Manager was established and was responsible to develop the Nuclear Development QAPD and to independently plan and perform activities to verify the development and effective implementation of the QAPD to those activities that support the COLA. The Nuclear Development QA Manager was also responsible to evaluate compliance with regulatory requirements and procedures through audits and technical reviews, monitor organization processes to ensure conformance to licensing document requirements, and to ensure that vendors providing quality services to Detroit Edison in support of the COLA are meeting the requirements of 10 CFR 50 Appendix B.

In April 2008, PMM Phase I was revised to communicate to Detroit Edison and all team members the addition of two B&V subcontractors.

In May 2008, the Nuclear Development QA Manager, as lead auditor, conducted a surveillance of B&V COLA development activities using Nuclear Development Procedure (NDP)-NP-18.1 for the purpose of assessing the adequacy of B&V Project Instruction 147483.21.2008 (Rev. 2), "Fermi 3 COLA Process Workflow for Preparing Site-Specific FSAR and ER Sections," for the preparation of quality site-specific information to be placed in the Fermi 3 COLA. Specific process areas reviewed were: procedure use and adherence, QA oversight effectiveness, corrective action, and staff training. The surveillance concluded that B&V had a good understanding of procedural requirements and was committed to providing a quality product to Detroit Edison.

In June 2008, the Nuclear Development QA Manager, as lead auditor, conducted a surveillance of the storage and handling of the core drilling and subsurface samples in Detroit Edison's possession, including record reviews and interviews.

In September 2008, B&V Nuclear Quality Assurance conducted a surveillance of activities associated with the preparation of the Fermi 3 COLA. The surveillance reviewed records generated during the review of COLA product. This review included examining the implementation of the RFR process for resolution of comments and consolidation in preparation for storage and retention, record storage and retention. The surveillance also examined B&V's training records and their implementation of the corrective action program to the Fermi 3 COLA project.

On September 18, 2008, Detroit Edison submitted an "Application for a Combined License for Fermi 3" under NRC Project No. 757 (ML082730763). By letter dated November 25, 2008 (ML082381145), the NRC notified Detroit Edison that the NRC staff had completed its acceptance review and had determined that the COLA was acceptable for docketing and that docket number 52-033 had been established for the Fermi 3 COLA.

Application for the Combined Operating License (September 2008 to December 2009)

After submittal of the COLA, Nuclear Development prepared, approved, and trained on the procedures necessary to adopt the Fermi 3 Quality Assurance Program Description (QAPD) provided in Appendix 17AA of the FSAR, and to support the post-application scope of work. In this transition, Detroit Edison took ownership of the application; however, contractually, Detroit Edison continued to delegate the execution of quality and safety-related services associated with COLA revision and review support to the B&V 10 CFR 50 Appendix B/NQA-1 QA program under the Fermi 3 QAPD.

In November 2008, Nuclear Development Procedure (NDP) NP-6.4, "COLA Change Process," was issued and provided four integrated processes necessary to maintain the COLA: request for information, license change request, request for review, and change incorporation.

The Nuclear Development Request for Information (NDRFI) provides a process to request safety-related services from B&V pertaining to COLA sections that were originally developed under the B&V 10 CFR 50 Appendix B/NQA-1 QA program as specified in the COLA contract. In response to an NDRFI, B&V executes the necessary safety-related activities to provide the requested information such as 1) responses to NRC requests for additional information including the associated FSAR markup, 2) markup of the FSAR necessary to implement a change to the certified design, 3) markup of the FSAR necessary to implement a change to the site layout, 4) markup of the FSAR as a result of implementation following approval of an industry template, etc. Subsequently B&V's response to the NDRFI was reviewed and accepted for incorporation into a COLA revision or a response to an NRC Request for Additional Information (RAI).

The Nuclear Development License Change Request (NDLCR) provides a controlled process to document approval of individual changes to the Fermi 3 COLA for incorporation. The NDLCR documents the references (e.g. NDRFI, Detroit Edison RAI response, etc.) supporting the change to the COLA and provides for coordination with the Reference COLA (R-COLA) as necessary.

The Nuclear Development Request for Review (NDRFR) provides a process to document comments resulting from an individual or organization's review of a proposed change to the COLA and the resolution of those comments.

The change incorporation process provides for the incorporation of an approved NDLCR into the COLA for approval and subsequent submission.

In February 2009, B&V established a new Project Management Memorandum for "Detroit Edison (Fermi Site) COL Application Phase II" (PMM Phase II), Rev. 0 for the engineering site characterization, field investigation and licensing activities necessary to support Detroit Edison interaction with the NRC subsequent to the submittal of the COLA. PMM Phase II identified to Detroit Edison and all team members (including subcontractors) the scope of the project, means of

correspondence, document control requirements, project specific quality assurance requirements, training requirements, applicable B&V procedures, and applicable codes and standards. Subsequently, those B&V project instructions necessary to support Phase II were issued, including Project Instruction 163696.21.2001, "Fermi 3 COL Request for Information to an Outside Organization."

In March 2009, Detroit Edison submitted an updated COLA reflecting the updated R-COLA and ESBWR DCD, Revision 5 under cover of Detroit Edison letter NRC3-09-0006 dated March 25, 2009 (ML091760903). Concurrently, the Fermi 3 QAPD was revised to reflect the QAPD presented in FSAR, Appendix 17AA of the March 2009 COLA submission.

In June 2009, the quality assurance organization began reporting to the Sr. Vice President, Major Enterprise Projects as described in FSAR Appendix 17AA. The quality assurance organization was lead by the Director, Quality Management and consists of two full time equivalent staff, including as a minimum the Director and one lead-auditor-qualified individual. The quality assurance organization was responsible for verifying that B&V effectively implements those QA functions necessary to support safety-related activities and safety-related COLA work product. The quality assurance group schedules and conducts surveillances and audits of quality activities in accordance with the Fermi 3 QAPD and the established schedule.

In July 2009, the quality assurance organization, with technical support from Nuclear Development, performed a limited scope audit of implementation of the B&V 10 CFR 50 Appendix B/NQA-1 QA program to Detroit Edison contracts for COLA activities. The audit concluded that the B&V 10 CFR 50 Appendix B/NQA-1 QA program was well documented in the Nuclear Organization Quality Assurance Manual, Nuclear Procedures, and Fermi 3 Project instructions.

In September 2009, the NDRFI process was established as a stand alone procedure to allow for use outside of the COLA change processes.

In October 2009, the quality assurance organization, lead by the group's lead-auditor qualified individual supported by a lead auditor-in-training and an auditor-in-training, performed an audit to assess the effectiveness of the Nuclear Development organization's implementation of the Fermi 3 QAPD requirements. Assessment activities included verification of development and implementation of, and adherence to processes, procedures, and organizational structure for COLA activities set forth in the QAPD.

In November 2009, an external audit to assess the effectiveness of the Nuclear Quality Management organization's implementation of the Fermi 3 QAPD requirements was conducted. The audit concluded that the Fermi 3 Quality Assurance Program was effectively implemented and in compliance with the Fermi 3 QAPD.

QA applied to activities to adapt the design to specific plant implementation, construction, and operations is addressed in the Detroit Edison Fermi 3 QAPD (Appendix 17AA). The QAPD is based on NEI 06-014A (Reference 17.5-201).

The implementation milestones for the Operational Quality Assurance Program are provided in Section 13.4.

References

17.5-201 Nuclear Energy Institute, “Quality Assurance Program Description.” NEI 06-14A, Revision 7, August, 2010. HISTORICAL

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 1 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.0 Section Development	April 16, 2008 – June 17, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	June 17, 2008	Initial Review/Acceptance June 18, 2008 – July 9, 2008 Final Review/Acceptance July 3, 2008 – September 16, 2008
FSAR Section 2.1 Section Development	December 17, 2007 – June 6, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	June 6, 2008	Initial Review/Acceptance June 6, 2008 – July 11, 2008 Final Review/Acceptance July 3, 2008 – September 16, 2008
FSAR Section 2.2 Section Development	September 28, 2007 – June 5, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 5, 2008	Initial Review/Acceptance June 5, 2008 – July 8, 2008 Final Review/Acceptance July 3, 2008 – September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 2 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.2 Chemical Hazards Calculation	July 30, 2007 – July 31, 2008	By Numerical Applications Inc. (NAI) using HABIT computer code under the NAI QA Plan NAI-QA-1, Revision 14. Contract for work on Fermi project established between B&V and NAI on June 18, 2007.	NAI QA (as accepted by B&V)	B&V performed audit to establish NAI as a qualified supplier on November 29, 2006. NAI deliverable reviewed per B&V Nuclear Procedures.	July 31, 2008	Note 2
FSAR Sections 2.3.1 through 2.3.3 Section Development	August 27, 2007 – May 24, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	May 24, 2008	Initial Review/Acceptance June 6, 2008 – July 11, 2008 Final Review/Acceptance August 15, 2008 – September 16, 2008
FSAR Sections 2.3.4 and 2.3.5 Section Development	August 27 2007 – June 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instruction. Section validated per B&V Project Instructions.	June 10, 2008	Initial Review/Acceptance June 10, 2008 – July 29, 2008 Final Review/Acceptance August 15, 2008 – September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 3 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.3.4 Short Term X/Q Analysis	December 14, 2007 – August 8, 2008	By Numerical Applications Inc. (NAI) using PAVAN computer code under the NAI QA Plan NAI-QA-1, Revision 14. Contract for work on Fermi project established between B&V and NAI on June 18, 2007.	NAI QA (as accepted by B&V)	B&V performed audit to establish NAI as a qualified supplier on November 29, 2006. NAI deliverable reviewed per B&V Nuclear Procedures.	August 8, 2008	Note 2
FSAR Section 2.3.4 On-Site X/Q Analysis	December 14, 2007 – August 8, 2008	By Numerical Applications Inc. (NAI) using ARCON96 computer code under the NAI QA Plan NAI-QA-1, Revision 14. Contract for work on Fermi project established between B&V and NAI on June 18, 2007.	NAI QA (as accepted by B&V)	B&V performed audit to establish NAI as a qualified supplier on November 29, 2006. NAI deliverable reviewed per B&V Nuclear Procedures.	August 8, 2008	Note 2
FSAR Section 2.3.5 Long Term X/Q Analysis	December 14, 2007 – August 8, 2008	By Numerical Applications Inc. (NAI) using XOQDOQ computer code under the NAI QA Plan NAI-QA-1, Revision 14. Contract for work on Fermi project established between B&V and NAI on June 18, 2007.	NAI QA (as accepted by B&V)	B&V performed audit to establish NAI as a qualified supplier on November 29, 2006 NAI deliverable reviewed per B&V Nuclear Procedures.	August 8, 2008	Note 2

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 4 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.4.1 Section Development	December 13, 2007 – June 3, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 3, 2008	Initial Review/Acceptance June 3, 2008 – July 9, 2008 Final Review/Acceptance July 3, 2008 - September 16, 2008
FSAR Section 2.4.2 Section Development	February 13, 2008 – June 3, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 3, 2008	Initial Review/Acceptance June 3, 2008 – July 9, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.3 Section Development	February 13, 2008 – June 3, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 3, 2008	Initial Review/Acceptance June 3, 2008 – July 9, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 5 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.4.4 Section Development	February 18, 2008 – April 11, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions Section validated per B&V Project Instructions.	April 11, 2008	Initial Review/Acceptance April 11, 2008 – June 27, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.5 Section Development	March 13, 2008 – June 3, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 3, 2008	Initial Review/Acceptance June 3, 2008 – July 9, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.6 Section Development	February 18, 2008 – April 11, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 11, 2008	Initial Review/Acceptance April 11, 2008 – June 27, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 6 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.4.7 Section Development	February 18, 2008 – April 11, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 11, 2008	Initial Review/Acceptance April 11, 2008 – June 27, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.8 Section Development	August 30, 2007 – April 11, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 11, 2008	Initial Review/Acceptance April 11, 2008 – June 27, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.9 Section Development	January 24, 2008 – April 11, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 11, 2008	Initial Review/Acceptance April 11, 2008 – June 27, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 7 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.4.10 Section Development	April 24, 2008 – June 3, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 3, 2008	Initial Review/Acceptance June 3, 2008 – July 9, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.11 Section Development	January 30, 2008 – June 3, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	June 3, 2008	Initial Review/Acceptance June 3, 2008 – July 9, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.12 Section Development	February 29, 2008 – June 5, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 5, 2008	Initial Review/Acceptance June 5, 2008 – July 28, 2008 Final Review/Acceptance July 3, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 8 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.4.12 Developing Wells	May 3, 2007 – June 7, 2007	By Boart Longyear/Prosonic under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Boart Longyear determined to be acceptable sub-contractor per B&V procedures on May 1, 2007. Data Collection Plan (DCP), Work Plan (WP) and Specification developed per B&V Procedures. B&V maintained field oversight during drilling operations. Surveillance of on-site hydrogeology activities performed, May 31, 2007.	April 23, 2007 (DCP and WP approval)	Note 2
FSAR Section 2.4.12 Field Permeability Tests	May 21, 2007 – June 28, 2007	By Boart Longyear/Prosonic under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Boart Longyear determined to be acceptable sub-contractor per B&V procedures on May 1, 2007. Data Collection Plan (DCP), Work Plan (WP) and Specification developed per B&V Procedures. Testing performed per DCP and WP under B&V direction.	April 23, 2007 (DCP and WP approval)	Note 2

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 9 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.4.12 Water Analytical Analysis	August 1, 2007 – March 12, 2008	By PSI under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	PSI qualified as a commercial grade supplier per B&V procedures, April 25, 2007. Surveillance of laboratory activities performed, September 21, 2007. Water analytical testing performed per PSI procedures. Laboratory report reviewed by B&V	March 12, 2008	Note 2
FSAR Section 2.4.13 Section Development	May 2, 2008 – May 23, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	May 23, 2008	Initial Review/Acceptance May 23, 2008 – June 30, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.4.14 Section Development	April 21, 2008 – April 28, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 28, 2008	Initial Review/Acceptance April 29, 2008 – June 10, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 10 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.5.1 Section Development	November 28, 2007 – April 4, 2008	By B&V and Geomatrix under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Geomatrix qualified per B&V procedures, July 3, 2007. B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	April 4, 2008	Initial Review/Acceptance April 4, 2008 – June 26, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 2.5.2 Section Development	December 13, 2007 – June 12, 2008	By Geomatrix under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Geomatrix qualified per B&V procedures, July 3, 2007 B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	June 12, 2008	Initial Review/Acceptance June 12, 2008 –July 31, 2008 Final Review/Acceptance July 3, 2008 - September 16, 2008
FSAR Section 2.5.3 Section Development	December 13, 2007 – May 6, 2008	By Geomatrix under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Geomatrix qualified per B&V procedures, July 3, 2007. B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	May 6, 2008	Initial Review/Acceptance May 6, 2008 – July 3, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 11 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.5.4 Section Development	December 13, 2007 – May 6, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	May 6, 2008	Initial Review/Acceptance May 6, 2008 – July 8, 2008 Final Review/Acceptance July 3, 2008 - September 16, 2008
FSAR Section 2.5.5 Section Development	December 13, 2007 – May 6, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	May 6, 2008	Initial Review/Acceptance May 6, 2008 – July 8, 2008 Final Review/Acceptance July 3, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 12 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.5 Boring Operations	June 12, 2007 – September 21, 2007	By Boart Longyear/Prosonic under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Boart Longyear determined to be acceptable sub-contractor per B&V procedures on May 1, 2007 Data Collection Plan (DCP), Work Plan (WP) and Specification developed per B&V Procedures. B&V maintained field oversight during drilling operations. Surveillance of on-site hydrogeology and geotechnical activities performed, May 31, 2007, September 19, 2007, and December 5, 2007.	Various dates tied to revisions to DCP and WP.	Note 2
FSAR Section 2.5 Geotechnical Laboratory Analysis	June 4, 2007 – July 2, 2008	By PSI under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	PSI qualified as a commercial grade supplier per B&V procedures, April 25, 2007. Surveillance of laboratory activities performed, September 21, 2007. Geotechnical laboratory testing performed per PSI procedures. Laboratory report reviewed by B&V	July 2, 2008	Note 2

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 13 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 2.5 Geotechnical Laboratory Analysis	April 22, 2008 - July 25, 2008	By Kleinfelder under the PSI Quality Assurance Program under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Kleinfelder qualified as a sub-contractor to PSI. Analytical testing performed per Kleinfelder test plan, reviewed by B&. Laboratory report reviewed by B&V	July 25, 2008	Note 2
FSAR Section 2.5 Field Geotechnical Testing	July 10, 2007 - June 16, 2008	By ARM Geophysics under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	ARM qualified per B&V procedures, June 29, 2007 Field testing performed in accordance with ARM procedures. Geophysical well logging report reviewed by B&V.	June 16, 2008	Note 2
FSAR Section 2.5 Field Geotechnical Testing	September 12, 2007 - March 14, 2008	By GEOVision under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	GEOVision qualified per B&V procedures, June 27, 2007 Field testing performed in accordance with GEOVision procedures, reviewed by B&V. Geophysical testing report reviewed by B&V.	March 14, 2008	Note 2
FSAR Section 2.5 Field Geotechnical Testing	September 14, 2007 – January 25, 2008	By In Situ Engineering under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	Field testing performed in accordance with In Situ Engineering Technical Specification, reviewed by B&V. Geophysical testing report reviewed by B&V.	January 25, 2008	Note 2

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 14 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Chapter 3 Section Development	December 10, 2007 – January 25, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	January 25, 2008	Initial Review/Acceptance February 6, 2008 – June 30, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Chapter 4 Section Development	November 5, 2007 – December 14, 2007	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	December 14, 2007	February 6, 2008 – April 21, 2008
FSAR Chapter 5 Section Development	January 14, 2008 – January 25, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	January 25, 2008	Initial Review/Acceptance February 6, 2008 – April 4, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Chapter 6 (Excluding Section 6.4) Section Development	January 10, 2008 – February 6, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	February 6, 2008	Initial Review/Acceptance February 6, 2008 – April 8, 2008 Final Review/Acceptance July 3, 2008 – August 15, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 15 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 6.4 Section Development	April 28, 2008 – May 30, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. (RFR-0262) Calculations verified per Nuclear Procedures. Section validated per B&V Project Instructions.	May 30, 2008	Initial Review/Acceptance May 30, 2008 – July 22, 2008 Final Review/Acceptance July 3, 2008 – August 15, 2008.
FSAR Chapter 7 Section Development	November 9, 2007 – December 14, 2007	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	December 14, 2007	February 6, 2008 – February 27, 2008
FSAR Chapter 8 Section Development	January 14, 2008 – May 23, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	May 23, 2008	Initial Review/Acceptance May 23, 2008 – July 21, 2008 Final Review/Acceptance July 3, 2008 – August 15, 2008
FSAR Section 9.1 Section Development	March 17, 2008 – April 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 10, 2008	Initial Review/Acceptance April 11, 2008 – July 1, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 16 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 9.2 (Excluding Section 9.2.3) Section Development	January 31, 2008 – April 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 10, 2008	Initial Review/Acceptance April 11, 2008 – July 1, 2008 Final Review/Acceptance June 3, 2008 - September 16, 2008
FSAR Section 9.2.3 Section Development	March 14, 2008 – April 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 10, 2008	Initial Review/Acceptance April 11, 2008 – July 1, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008
FSAR Section 9.3 Section Development	March 18, 2008 – April 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 10, 2008	Initial Review/Acceptance April 11, 2008 – July 1, 2008 Final Review/Acceptance August 15, 2008 - September 16, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 17 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Section 9.4 Section Development	March 18, 2008 – April 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 10, 2008	Initial Review/Acceptance April 11, 2008 – July 1, 2008 Final Review/Acceptance June 3, 2008 - September 16, 2008
FSAR Section 9.5 Section Development	January 14, 2008 – April 10, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	April 10, 2008	Initial Review/Acceptance April 11, 2008 – July 1, 2008 Final Review/Acceptance June 3, 2008 - September 16, 2008
FSAR Chapter 14 Section Development	January 16, 2008 – February 8, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	February 8, 2008	Initial Review/Acceptance February 8, 2008 – June 30, 2008 Final Review/Acceptance July 3, 2008 – September 16, 2008
FSAR Chapter 15 Section Development	November 11, 2007 – December 14, 2007	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	December 14, 2007	February 6, 2008 – July 22, 2008

Table 17.5-201 Quality Assurance Activities for FSAR Section and Supporting Activities (Sheet 18 of 18)

The entire content of this table is HISTORICAL information.

COLA Section and Supporting Activity(ies)	Date of the Section Creation or Activity	Organization Creating and Governing QAPD	QA organization Responsible for Oversight	Dates and Type of any Specific Contractor QA Oversight Activities (i.e. Surveillance, document review, etc)	Contractor's Approval Date	Date of Detroit Edison Review and Acceptance (see Note 1)
FSAR Chapter 16 Section Development	May 9, 2008 – May 21, 2008	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	May 21, 2008	Initial Review/Acceptance May 21, 2008 – July 8, 2008 Final Review/Acceptance July 3, 2008 – September 16, 2008
FSAR Chapter 18 Section Development	October 16, 2007 – December 14, 2007	By B&V under the B&V Nuclear Organization Quality Assurance Manual, Revisions 2 and 3.	B&V QA	B&V review performed per Nuclear Procedures and Project Process Instructions. Section validated per B&V Project Instructions.	December 14, 2007	February 6, 2008 – February 27, 2008

Notes:

1. Detroit Edison reviewed FSAR chapters and sections as prescribed by Standard Work Instruction (SWI) –03-001-001-0529, "COLA Section and Chapter Review and Acceptance Process." SWI-03-001-001- 0529 prescribed that Nuclear Development staff were to confirm that COLA products prepared by B&V would be acceptable by the NRC. SWI-03-001-001-0529 noted that COLA preparation remained the responsibility of B&V.
2. COLA intermediary work product produced by activities to support COLA section development was not directly reviewed by Detroit Edison. Detroit Edison reviewed the presentation of the information or result from this activity by reviewing incorporation of the information or result from this activity in the COLA section identified above (see Column 7).

17.6 Maintenance Rule Program

NEI 07-02A, “Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52", (Reference 17.6-1) is incorporated by reference with the following supplemental information:

The text of the template provided in NEI 07-02A is generically numbered as “17.X.” When the template is incorporated by reference into this section, numbering is changed from “17.X” to “17.6.”

17.6.1.1 Maintenance Rule Scoping per 10 CFR 50.65(b)

In Paragraph 17.6.1.1.b, replace “(DRAP - see FSAR Section 17.Y)” with the following.

(See Section 17.4)

17.6.3 Maintenance Rule Program Relationship with Reliability Assurance Activities

Replace with the following.

Reliability during the operations phase is assured through the implementation of operational programs, i.e., the MR program (Section 17.6), the Quality Assurance Program (Section 17.5), the Inservice Inspection Program (Subsection 5.2.4, Section 6.6, and Section 3.8.1.7.3), and the Inservice Testing Program (Subsection 3.9.6, and 3.9.3.7.1(3)e), as well as the Technical Specifications Surveillance Requirements (Chapter 16), and maintenance programs.

17.6.4 Maintenance Rule Program Relationship with Industry Operating Experience Activities

Add the following at the end of this section.

Condition monitoring of underground or inaccessible cables is incorporated into the maintenance rule program. The cable condition monitoring program incorporates lessons learned from industry operating experience (e.g., GL 2007-01, NUREG/CR-7000), addresses regulatory guidance, and utilizes information from detailed design and procurement documents to determine the appropriate inspections, tests and monitoring criteria for underground and inaccessible cables within the scope of the maintenance rule (10 CFR 50.65).

17.6.5 References

17.6-1 Nuclear Energy Institute, “Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52,” NEI 07-02A.

Appendix 17AA Fermi 3 Quality Assurance Program Description

The QAPD has been removed from the UFSAR. It is incorporated by Reference into the UFSAR and is being maintained in accordance with the requirements of 10 CFR 50.54(a) and 10 CFR 50.55(f) as applicable.