FINAL SAFETY ANALYSIS REPORT

CHAPTER 6

ENGINEERED SAFETY FEATURES

6.0 ENGINEERED SAFETY FEATURES

This chapter of the U.S. EPR Final Safety Analysis Report (FSAR) is incorporated by reference with supplements as identified in the following sections.

6.1 ENGINEERED SAFETY FEATURES MATERIALS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

6.1.1 METALLIC MATERIALS

No departures or supplements.

6.1.1.1 Materials Selection and Fabrication

The U. S. EPR FSAR includes the following COL Item in Section 6.1.1.1:

> A COL applicant that references the U. S. EPR design certification will review the fabrication and welding procedures and other QA methods of ESF component vendors to verify conformance with RGs 1.44 and 1.31.

This COL Item is addressed as follows:

{PPL Bell Bend, LLC} will select vendors in accordance with requirements in the Quality Assurance Program Description (QAPD) referenced in FSAR Section 17.5.

Section G of the QAPD describes Control of Purchased Material, Equipment and Services. The QAPD establishes measures to provide control of special processes. Special processes that control or verify quality, such as those used in welding, heat treating, and nondestructive examination, must be performed by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements. Ensuring the vendor processes conform to Regulatory Guides 1.31 and 1.44 (NRC, 1978 and NRC, 1973) will be accomplished by this license condition:

{PPL Bell Bend, LLC} will include, or require its contractors to include, a review of special processes such as fabrication and welding procedures and other QA methods to verify conformance with Regulatory Guides 1.31 and 1.44 for ESF components as part of the procurement process. The procurement process will be established prior to purchasing ESF components.

This will ensure that conformance with RG 1.31 and 1.44 will be established within the appropriate vendor processes prior to initiation of any fabrication activity that would be subject to NRC construction inspection program.

6.1.1.2 ESF Fluids

No departures or supplements.

6.1.1.3 Component and Systems Cleaning

No departures or supplements.

6.1.1.4 Thermal Insulation

No departures or supplements.

6.1.2 ORGANIC MATERIALS

No departures or supplements.

6.1.2.1 Description of Protective Coatings

No departures or supplements.

6.1.2.2 Safety Evaluation

No departures or supplements.

6.1.2.3 Quality Assurance

No departures or supplements.

6.1.2.3.1 Special Processes

No departures or supplements.

6.1.2.3.2 Service Level I Coatings

The U. S. EPR FSAR includes the following COL Item in Section 6.1.2.3.2:

> If components cannot be procured with DBA-qualified coatings applied by the component manufacturer, a COL applicant that references the U. S. EPR design certification must do one of the following:
>
> - Procure the component as uncoated and apply a DBA-qualified coating system in accordance with 10 CFR 50, Appendix B, Criterion IX.
> - Confirm that the DBA-unqualified coating is removed and that the component is recoated with DBA-qualified coatings in accordance with 10 CFR 50, Appendix B, Criterion IX.
> - Add the quantity of DBA-unqualified coatings to a list that documents those DBA-unqualified coatings already existing within containment.

This COL Item is addressed as follows:

If components cannot be procured with DBA-qualified coatings applied by the component manufacturer, {PPL Bell Bend, LLC} shall do one of the following:

- Procure the component as uncoated and apply a DBA-qualified coating system in accordance with 10 CFR 50, Appendix B, Criterion IX. The DBA-qualified (i.e., Service Level 1) coating will be applied in accordance with the applicable standards stated in Regulatory Guide 1.54, Rev. 1 (NRC, 2000), except as modified by U.S. EPR FSAR Section 6.1.2.4.
- Confirm that the DBA-unqualified coating is removed and that the component is recoated with DBA-qualified coatings in accordance with 10 CFR 50, Appendix B, Criterion IX. The DBA-qualified (i.e., Service Level 1) coating will be applied in accordance with the applicable standards stated in Regulatory Guide 1.54, Rev. 1 (NRC, 2000), except as modified by U.S. EPR FSAR Section 6.1.2.4.
- Add the quantity of DBA-unqualified coatings to a list that documents those DBA-unqualified coatings already existing within containment.

The protective coatings program will be implemented prior to the application of coatings on plant surfaces or equipment or the procurement of components and equipment with vendor applied coatings. The protective coatings program is implemented within plant administrative procedures. The administrative procedures are described in Section 13.5.1.

6.1.2.3.3 Service Level II Coatings

No departures or supplements.

6.1.2.3.4 Service Level III Coatings

No departures or supplements.

6.1.2.3.5 Protective Coating and Organic Materials Program

No departures or supplements.

6.1.2.4 Exceptions to Regulatory Guide 1.54, Revision 1

No departures or supplements.

6.1.3 REFERENCES

{**NRC, 1978.** Control of Ferrite Content in Stainless Steel Weld Metal, Regulatory Guide 1.31, Revision 3, U.S. Nuclear Regulatory Commission, April 1978.

NRC, 1973. Control of the Use of Sensitized Stainless Steel, Regulatory Guide 1.44, U.S. Nuclear Regulatory Commission, May 1973.}

6.2 CONTAINMENT SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

6.2.1 CONTAINMENT FUNCTIONAL DESIGN

No departures or supplements.

6.2.2 CONTAINMENT HEAT REMOVAL SYSTEMS

No departures or supplements.

6.2.3 SECONDARY CONTAINMENT FUNCTIONAL DESIGN

No departures or supplements.

6.2.4 CONTAINMENT ISOLATION SYSTEM

No departures or supplements.

6.2.5 COMBUSTIBLE GAS CONTROL IN CONTAINMENT

No departures or supplements.

6.2.6 CONTAINMENT LEAKAGE TESTING

The U.S. EPR FSAR includes the following COL Item in Section 6.2.6:

> A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the CLRT program described under 10 CFR 50, Appendix J.

This COL Item is addressed as follows:

Table 13.4-1 provides milestones for containment leak rate testing implementation in accordance with 10 CFR 50, Appendix J (CFR, 2008).

6.2.7 FRACTURE PREVENTION OF CONTAINMENT PRESSURE VESSEL

No departures or supplements.

6.2.8 REFERENCES

{**CFR, 2008.** Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors, Title10, Code of Federal Regulations, Part 50, Appendix J, U.S. Nuclear Regulatory Commission, 2008.}

6.3 EMERGENCY CORE COOLING SYSTEM

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

6.3.1 DESIGN BASES

No departures or supplements.

6.3.2 SYSTEM DESIGN

6.3.2.1 Schematic Piping and Instrumentation Diagrams

No departures or supplements.

6.3.2.2 Equipment and Component Descriptions

6.3.2.2.1 System Overview

No departures or supplements.

6.3.2.2.2 System Components

The U.S. EPR FSAR contains the following COL Item in Section 6.3.2.2.2:

> A COL applicant that references the U.S. EPR design certification will describe the containment cleanliness program which limits debris within containment.

This COL Item is addressed as follows:

The containment cleanliness program is consistent with the guidance provided in NEI 04-07 (NEI, 2004), as endorsed and modified by Regulatory Guide 1.39, Rev. 2 (NRC, 1977), Regulatory Guide 1.82, Rev. 3 (NRC, 2003), Regulatory Guide 1.206, June 2007 (NRC, 2007a), and NUREG-0800, March 2007 (NRC, 2007b). The principal functions of the program are described below.

Latent debris is controlled by limiting the number of potential debris sources prior to reactor containment closeout before plant operation. This effort includes control of intended debris sources and unintended debris sources. General surveys consisting of visual examination of containment shall be performed every refueling outage. Surveys with detailed calculations of latent debris shall be performed every other outage. Additional surveys shall be conducted after invasive or extended maintenance activities.

Visual inspection of containment for loose debris is performed to reduce intended and unintended debris sources. Visual inspection includes all levels of the containment; including the trash racks, the weirs, and the retaining baskets located below each heavy floor opening. The inspection shall include the Safety Injection System (SIS) and the Severe Accident Heat Removal System (SAHRS) strainers located above each respective sump. The containment cleanliness program shall be implemented through procedures to limit intended and unintended latent debris inside containment.

Examples of intended debris include equipment tags that are not permanent, stickers or placards (adhered with adhesive), and tape. The use of non-permanent tags and stickers shall be controlled by procedure in order to identify potential loading from these sources. The use of tape shall also be monitored and removed once its use has been met. Tape that remains in-place shall be identified as another debris loading source. Storage of outage materials such

as temporary scaffolding and tools inside containment during power operation shall be monitored. Loose insulation on piping and equipment inside containment shall be considered as a transport potential. Debris transport is considered in identifying the amount of debris from these sources that reaches the sump.

Unintended debris sources include dust and other particulates that result from in-containment maintenance activities or deterioration of in-containment materials. These sources shall be inspected and an estimate of loading developed based on the inspection results. Statistical sample mass collection is the method used for quantifying latent debris inventories. This inspection is performed on an every other refueling frequency basis in conjunction with containment close-out procedures. This inspection and characterization includes vertical surfaces as well as horizontal surfaces. Inaccessible and accessible areas are considered. Based on inspections, any failures of qualified coatings is included.

The major debris source will be from those SSCs in the zone of influence.

6.3.2.3 Applicable Codes and Classifications

No departures or supplements.

6.3.2.4 Material Specifications and Compatibility

No departures or supplements.

6.3.2.5 System Reliability

No departures or supplements.

6.3.2.6 Protection Provisions

No departures or supplements.

6.3.2.7 Provisions for Performance Testing and Inspection

No departures or supplements.

6.3.2.8 Manual Actions

No departures or supplements.

6.3.3 PERFORMANCE EVALUATION

No departures or supplements.

6.3.4 TESTS AND INSPECTIONS

No departures or supplements.

6.3.5 INSTRUMENTATION REQUIREMENTS

No departures or supplements.

6.3.6 REFERENCES

{**NEI, 2004.** Pressurized Water Reactor Sump Performance Evaluation Methodology, NEI 04-07, Nuclear Energy Institute, May 2004.

NRC, 1977. Housekeeping Requirements for Water-Cooled Nuclear Power Plants, Regulatory Guide 1.39, Rev. 2, U.S. Nuclear Regulatory Commission, September, 1977.

NRC, 2003. Water Sources for Long Term Recirculation Cooling Following a Loss-of-Coolant Accident, Regulatory Guide 1.82, Rev. 3, U.S. Nuclear Regulatory Commission, November, 2003.

NRC, 2007a. Combined License Applications for Nuclear Power Plants, Regulatory Guide 1.206, U.S. Nuclear Regulatory Commission, Revision 0, June 2007.

NRC, 2007b. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, NUREG-0800, U.S. Nuclear Regulatory Commission, March, 2007.}

6.4 HABITABILITY SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements {and departures.}

6.4.1 DESIGN BASIS

{No departures or supplements.}

6.4.2 SYSTEM DESIGN

6.4.2.1 Definition of Control Room Envelope

{No departures or supplements.}

6.4.2.2 Ventilation System Design

{No departures or supplements.}

6.4.2.3 Leaktightness

{No departures or supplements.}

6.4.2.4 Interaction with Other Zones and Pressure-Containing Equipment

{This section of the U. S. EPR FSAR is incorporated by reference with the following departures:

An evaluation of the site-specific toxic chemicals hazards in BBNPP FSAR Section 2.2.3 did not identify any credible toxic chemical accidents that exceeded the Main Control Room IDLH limits within two minutes of detection. In accordance with regulatory Guide 1.78 (NRC, 2001), human exposures to toxic chemicals can be tolerated for up to two minutes at IDLH without incapacitation. Thus, a two minute exposure to IDLH limits provides an adequate margin of safety for control room operators. It is expected that a control room operator will take protective measures within two minutes (adequate time to don a respirator and protective clothing) after the detection and, therefore, will not be subjected to prolonged exposure at the IDLH concentration levels. The only chemical hazards thatr esult in exceeding the IDHL after two minuute from detecytion threshhold in the control room are natural gas/methane and ammonia and are identified in FSAR Table 2.2-10. No specific detection and automatic actuation features are necessary to protect the control room operators from an event involving release ofa toxic gas. therefore, detection of toxic gases and subsequent automatic isolation of the Control Room Envelope is not required and is not part of the BBNPP site-specific design basis. This represents a Departure from the U. S. EPR FSAR.}

6.4.2.5 Shielding Design

{No departures or supplements.}

6.4.3 SYSTEM OPERATIONAL PROCEDURES

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements {and departures}.

The U.S. EPR FSAR includes the following COL Holder Item in Section 6.4.3:

A COL applicant that references the U.S. EPR design certification will provide written emergency planning and procedures in the event of a radiological or hazardous chemical release within or near the plant, and will provide training of control room personnel.

This COL Holder Item is addressed as follows:

{PPL Bell Bend, LLC} shall provide written emergency planning and procedures for use in the event of a radiological or hazardous chemical release within or near the plant, and will provide training of control room personnel, prior to receipt of fuel onsite at {BBNPP}.

{A control room operator will take protective measures within two minutes, as explained in Section 6.4.2.4.}

6.4.4 DESIGN EVALUATIONS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements .

The U.S. EPR FSAR includes the following COL Item in Section 6.4.4:

A COL applicant that references the U.S. EPR design certification will confirm that the radiation exposure of MCR occupants resulting from a DBA at a nearby unit on a multi-unit site is bounded by the radiation exposure from the postulated design basis accidents analyzed for the U.S. EPR; or confirm that the limits of GDC 19 are met.

This COL Item is addressed as follows:

{The main control room dose to SSES Units 1 and 2 from a BBNPP LOCA is less than 1.0 rem TEDE. This dose is well below the regulatory dose acceptance criterion of 5 rem TEDE. The BBNPP Main Control Room (MCR) is better designed and equipped for radiological exposure control. Therefore, a LOCA in SSES Unit 1 or 2, which already meets the acceptance criteria for the applicable control room, will also meet the acceptance criteria for the BBNPP Main Control Room. The BBNPP MCR is equipped with safety-related radiation monitors in the HVAC intake ducts and would isolate in a timely manner. The BBNPP MCR HVAC emergency filtration system design basis accident configuration is described in U.S. EPR FSAR 15.0.3.}

The U.S. EPR FSAR includes the following COL Item in Section 6.4.4:

A COL applicant that references the U.S. EPR design certification will evaluate the results of the toxic chemical accidents from Section 2.2.3 and address their impact on control room habitability in accordance with RG 1.78.

This COL Item is addressed as follows:

{The evaluation of the BBNPP toxic chemicals in Section 2.2.3 did not identify any credible toxic chemical accidents that exceed the limits established in Regulatory Guide 1.78 (NRC, 2001). As a result, toxic gas detectors and CRE isolation are not required for BBNPP.}

6.4.5 TESTING AND INSPECTION

{No departures or supplements.}

6.4.6 INSTRUMENTATION REQUIREMENTS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements {and departures.

No specific detection and automatic actuation features are necessary to protect the control room operators from an event involving release of a toxic gas, as explained in Section 6.4.2.4.}

The U.S. EPR FSAR includes the following and COL Item in Section 6.4.6:

A COL applicant that references the U.S. EPR design certification will identify the type(s) of Seismic Category I Class IE toxic gas sensors (i.e. the toxic chemical(s) of concern) necessary for control room operator protection.

This COL Item is addressed as follows:

{An evaluation of the site-specific toxic chemicals in Section 2.2.3 did not identify any credible toxic chemical accidents that exceed the Main Control Room IDLH limits within two minutes of detection, as explained in Section 6.4.2.4..}

6.4.7 REFERENCES

{**NRC, 2001.** Evaluating the Habitability of a Nuclear Power Plant Control Room during a Postulated Hazardous Chemical Release, Regulatory Guide 1.78, Revision 1, U.S. Nuclear Regulatory Commission, December 2001.}

6.5 FISSION PRODUCT REMOVAL AND CONTROL SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference.

6.6 INSERVICE INSPECTION OF CLASS 2 AND 3 COMPONENTS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

The U.S. EPR FSAR includes the following COL Item in Section 6.6:

> A COL applicant that references the U.S. EPR design certification will identify the implementation milestones for the site-specific ASME Section XI preservice and inservice inspection program for Class 2 and Class 3 components, consistent with the requirements of 10 CFR 50.55a(g). The program will identify the applicable edition and addenda of the ASME Code Section XI, and will identify additional relief requests and alternatives to Code requirements.

This COL Item is addressed as follows:

The site-specific preservice inspection and inservice inspection programs for Class 2 and Class 3 components meet the requirements of 10 CFR 50.55a(g), and comply with ASME Boiler and Pressure Vessel Code, Section XI, 2004 Edition (ASME, 2004). This code is consistent with that established in U.S. EPR FSAR Section 6.6. No relief requests or alternatives are required. The implementation milestones for the site-specific ASME Section XI preservice and inservice inspection programs for Class 2 and Class 3 components are identified in Table 13.4-1.

The initial inservice inspection program shall incorporate the latest edition and addenda of the ASME Boiler and Pressure Vessel Code approved in 10 CFR 50.55a(b) on the date 12 months before initial fuel load. Inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the Code incorporated by reference in 10 CFR 50.55a(b) 12 months before the start of the 120-month inspection interval (or the optional ASME Code cases listed in Regulatory Guide 1.147, that are incorporated by reference in 10 CFR 50.55a(b), subject to the limitations and modifications listed in 10 CFR 50.55a(b)).

Should relief requests be required, they will be developed through the regulatory process and submitted to the NRC for approval in accordance with 10 CFR 50.55a(g)(5). The relief requests shall include appropriate justifications and proposed alternative inspection methods.

6.6.1 COMPONENTS SUBJECT TO EXAMINATION

{Preservice and inservice inspection of site-specific Class 3 ESWEMS components are conducted in accordance with the ASME SectionXI, 2004 Edition (ASME, 2004). The site-specific ESWEMS components are identified in Table 6.6-1.}

6.6.2 ACCESSIBILITY

No departures or supplements.

6.6.3 EXAMINATION TECHNIQUES AND PROCEDURES

No departures or supplements.

6.6.4 INSPECTION INTERVALS

{The inspection intervals for site-specific ESWEMS components are defined by the ASME Section XI examination categories identified in Table 6.6-1.}

6.6.5 EXAMINATION CATEGORIES AND REQUIREMENTS

No departures or supplements.

6.6.6 EVALUATION OF EXAMINATION RESULTS

No departures or supplements.

6.6.7 SYSTEM PRESSURE TESTS

No departures or supplements.

6.6.8 AUGMENTED ISI TO PROTECT AGAINST POSTULATED PIPING FAILURES

{There is no high-energy site-specific piping associated with the ESWEMS.}

6.6.9 REFERENCES

{**ASME, 2004.** ASME Boiler and Pressure Vessel Code, Section XI, 2004 Edition, American Society of Mechanical Engineers, Inc., 2004.}

Table 6.6-1— {Inservice Inspection Requirements for Class 3 Site-Specific ESWEMS}

ASME Code Examination Category	Examination Area	Parts Examined	Method of Examination	Extent of Examination
D-A	Welded Attachments (components supports directly welded to the outside surface or to the integrally cast or forged attachments to pressure retaining components)	Piping	Visual, VT-1	100% of the length of the attachment weld
D-A	Welded Attachments (components supports directly welded to the outside surface or to the integrally cast or forged attachments to pressure retaining components)	Pumps	Visual, VT-1	100% of the length of the attachment weld
D-A	Welded Attachments (components supports directly welded to the outside surface or to the integrally cast or forged attachments to pressure retaining components)	Valves	Visual, VT-1	100% of the length of the attachment weld
D-B	All pressure retaining components	Pressure Retaining Components	Visual, VT-2 During system leakage tests	Pressure Retaining Boundary

6.7 MAIN STEAMLINE ISOLATION VALVE LEAKAGE CONTROL SYSTEM (BWRS)

This section of the U.S. EPR FSAR is incorporated by reference.

6.8 EXTRA BORATING SYSTEM

This section of the U.S. EPR FSAR is incorporated by reference.