## AdevaEPRDCPEm Resource

**From:** WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
**Sent:** Thursday, February 26, 2009 6:09 PM
**To:** Getachew Tesfaye
**Cc:** Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 118, FSAR Ch 3, Supplement 1
**Attachments:** RAI 118 Supplement 1 Response US EPR DC.pdf

Getachew,

AREVA NP Inc. provided responses to 4 of the 5 questions of RAI No. 118 on December 1, 2008. The attached file, “RAI 118 Supplement 1 Response US EPR DC.pdf” provides a technically correct and complete response to the remaining question, as committed.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 118 Question 03.04.01-7.

The following table indicates the respective pages in the response document, “RAI 118 Supplement 1 US EPR DC.pdf,” that contain AREVA NP’s response to the subject questions.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 118 — 03.04.01-7 | 2 | 4 |

This concludes the formal AREVA NP response to RAI 118, and there are no questions from this RAI for which AREVA NP has not provided responses.

Sincerely,

(Russ Wells on behalf of)
*Ronda Pederson*
ronda.pederson@areva.com
Licensing Manager, U.S. EPR Design Certification
New Plants Deployment
**AREVA NP, Inc.**
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

---

**From:** Pederson Ronda M (AREVA NP INC)
**Sent:** Monday, December 01, 2008 4:49 PM
**To:** 'Getachew Tesfaye'
**Cc:** BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); VAN NOY Mark (EXT)
**Subject:** Response to U.S. EPR Design Certification Application RAI No. 118 (1519, 1476),FSAR Ch. 3

Getachew,

Attached please find AREVA NP Inc.’s response to the subject request for additional information (RAI). The attached file, “RAI 118 Response US EPR DC.pdf” provides technically correct and complete responses to 4 of the 5 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which supports the response to RAI 118 Question 03.04.01-4.

The following table indicates the respective page in the response document, "RAI 118 Response US EPR DC.pdf," that contains AREVA NP's response to the each of the subject questions.

| Question # | Start Page | End Page |
|---|---|---|
| RAI 118 — 03.04.01-4 | 2 | 2 |
| RAI 118 — 03.04.01-5 | 3 | 3 |
| RAI 118 — 03.04.01-6 | 4 | 4 |
| RAI 118 — 03.04.01-7 | 5 | 5 |
| RAI 118 — 03.09.03-16 | 6 | 6 |

A complete answer is not provided for 1 of the 5 questions. The schedule for a technically correct and complete response to this question is provided below.

| Question # | Response Date |
|---|---|
| RAI 118 — 03.04.01-7 | February 26, 2009 |

Sincerely,

*Ronda Pederson*
ronda.pederson@areva.com
Licensing Manager, U.S. EPR(TM) Design Certification
**AREVA NP Inc.**
An AREVA and Siemens company
3315 Old Forest Road
Lynchburg, VA 24506-0935
Phone: 434-832-3694
Cell: 434-841-8788

---

**From:** Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
**Sent:** Wednesday, November 05, 2008 3:40 PM
**To:** ZZ-DL-A-USEPR-DL
**Cc:** Chang Li; Stephen Campbell; John Segala; Arnold Lee; Jennifer Dixon-Herrity; Michael Miernicki; Joseph Colaccino; John Rycyna
**Subject:** U.S. EPR Design Certification Application RAI No. 118 (1519, 1476),FSAR Ch. 3

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on October 22, 2008, and on October 29, 2008, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye

Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

**Hearing Identifier:** AREVA_EPR_DC_RAIs
**Email Number:** 258

**Mail Envelope Properties** (1F1CC1BBDC66B842A46CAC03D6B1CD410129841C)

**Subject:** Response to U.S. EPR Design Certification Application RAI No. 118, FSAR Ch 3, Supplement 1
**Sent Date:** 2/26/2009 6:08:54 PM
**Received Date:** 2/26/2009 6:08:59 PM
**From:** WELLS Russell D (AREVA NP INC)

**Created By:** Russell.Wells@areva.com

**Recipients:**
"Pederson Ronda M (AREVA NP INC)" <Ronda.Pederson@areva.com>
Tracking Status: None
"BENNETT Kathy A (OFR) (AREVA NP INC)" <Kathy.Bennett@areva.com>
Tracking Status: None
"DELANO Karen V (AREVA NP INC)" <Karen.Delano@areva.com>
Tracking Status: None
"Getachew Tesfaye" <Getachew.Tesfaye@nrc.gov>
Tracking Status: None

**Post Office:** AUSLYNCMX02.adom.ad.corp

| **Files** | **Size** | **Date & Time** |
|---|---|---|
| MESSAGE | 4143 | 2/26/2009 6:08:59 PM |
| RAI 118 Supplement 1 Response US EPR DC.pdf | | 228669 |

**Options**
**Priority:** Standard
**Return Notification:** No
**Reply Requested:** No
**Sensitivity:** Normal
**Expiration Date:**
**Recipients Received:**

**Response to**

**Request for Additional Information No. 118, Supplement 1**

**11/05/2008**

**U. S. EPR Standard Design Certification**
**AREVA NP Inc.**
**Docket No. 52-020**
**SRP Section: 03.04.01 - Internal Flood Protection for Onsite Equipment Failures**
**SRP Section: 03.09.03 - ASME Code Class 1, 2, and 3 Components**
**Application Section: FSAR Ch. 3**

**QUESTIONS for Balance of Plant Branch 2 (ESBWR/ABWR) (SBPB)**
**QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)**

**Question 03.04.01-7:**

10 CFR 52.47(b)(1), which requires that a design certification (DC) application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a plant that incorporates the design certification is built and will operate in accordance with the design certification, the provisions of the Atomic Energy Act, and the NRC's regulations. The FSAR Tier 2, Section 3.4.1 describes a flood-protection design to meet GDC 2 and GDC 4. SRP Section 3.4.1 Acceptance Criteria 3 asks the applicant to provide an ITAAC to verify the plant is built in accordance with the design certification. The staff reviewed the FSAR and could not find such an ITAAC.

The staff requests the applicant to provide additional ITAAC for verifying all important design features described in the FSAR Tier 2 Section 3.4 for flood protection are properly implemented. Important design features include that all the safety-related SSCs are located above the flood levels in all buildings containing safety-related equipment. In addition, other design features such as adequacy of the physical separation, all safety-related equipment areas being protected from cross-divisional flooding, watertight doors with indicators in the control room are verified in the ITAAC. As-built flood walk-downs as part of the ITAAC would assure these design features are fully implemented. In all buildings containing safety-related equipment, ITAAC should verify barrier integrity below the flood level and should verify the flood protection design features above the flood level (e.g., watertight doors and position indicators) are properly implemented.

**Response to Question 03.04.01-7:**

In the Emergency Power Generating Buildings (EPGB) and Essential Service Water Buildings (ESWB), internal flooding protection is provided by divisional separation features as described in U.S. EPR FSAR Tier 1:

- U.S. EPR FSAR Tier 1, Section 2.1.2, Item 4.2 states: “The EPGBs are separated to address internal hazards, including fire and flood as described in Table 2.1.2–1—EPGB Separation for Internal Hazards.”

- U.S. EPR FSAR Tier 1, Figure 2.1.5-1 shows that each division of essential service water system (ESWS) is in a separate building; therefore internal flooding between ESWS divisions is not an issue.

In the Safeguards Buildings (SB) and Fuel Building (FB), internal flooding protection is provided by physical separation between divisions below the 0’ 0” elevation and additional design features to be finalized by the COL Holder:

- U.S. EPR FSAR Tier 1, Section 2.1.1, Item 4.4 states: “The as-installed basic configuration of the NI structures, ~~as described in Section 2.1.1, 1.0 Description and~~ as indicated in Table 2.1.1-1—Separation For Internal Hazards, separates the four SBs and separates the FB from other NI structures so that the impact of internal hazards including fire, flooding, and high energy line break is contained within the SB or FB of hazard origination.” The phrase “as described in Section 2.1.1, 1.0 Description and” will be deleted in U.S. EPR FSAR Tier 1, Section 2.1.1, Item 4.4 and Table 2.1.1-7, Item 4.4 because Table 2.1.1-1 defines the basic configuration of the structures.

- The Inspection, Test, or Analysis column and the Acceptance Criteria column in U.S. EPR FSAR Tier 1, Table 2.1.1-7, Item 4.4 will be revised to add parts (f) through (i) to perform internal flooding analyses for the SBs and FB and to perform a walk down of the features identified in the internal flooding analyses. Parts (b) and (c) of U.S. EPR FSAR Tier 1, Table 2.1.1-7, Item 4.4 will be revised to indicate these parts are specific to fire protection analyses and features.

- U.S. EPR FSAR Tier 2, Section 3.4.1 and Table 1.8-2 will be revised to include a COL Information Item to perform the internal flooding analyses for the SBs and FB. "A COL applicant that references the U.S. EPR design certification will perform internal flooding analyses prior to fuel load for the Safeguard Buildings and Fuel Building to demonstrate that the impact of internal flooding is contained within the Safeguard Building or Fuel Building division of origin."

- Because internal flooding features for the SBs and FB will be identified from the new COL Information Item described above, items in U.S. EPR FSAR Tier 1, Section 2.1.1 related to internal flooding features are not necessary. U.S. EPR FSAR Tier 1, Section 2.1.1, Item 4.12, Item 4.13, and Table 2.1.1-6 will be deleted.

- U.S. EPR FSAR Tier 1 will be revised to clarify that Class 1E electrical cabinets are located above the SB flood levels. U.S. EPR FSAR, Tier 1, Section 2.5.1 and Table 2.5.1-3 will be revised to add Item 2.4, "Equipment identified as Class 1E in Table 2.5.1-2 and located in a Safeguard Building as indicated in Table 2.5.1-1 are located above elevation 0' 0", and U.S. EPR FSAR, Tier 1, Section 2.5.2 and Table 2.5.2-3 will be revised to add Item 2.4, "Equipment identified as Class 1E in Table 2.5.2-2 and located in a Safeguard Building as indicated in Table 2.5.2-1 are located above elevation 0' 0"."

In the Reactor Building (RB) and Reactor Building Annulus (RBA), internal flooding protection is achieved either by the location of essential SSC required for safe shutdown above the internal flood level or by designing the equipment to withstand the internal flooding event (for example, valve bodies may be below the flood level but valve operators are above the flood level). The COL Holder will complete the identification of essential SSCs required for safe shutdown that are not designed for flooding and verify their installation is above the internal flood level. U.S. EPR FSAR will be revised to clarify internal flooding protection for the RB and RBA:

- U.S. EPR FSAR Tier 1, Section 2.1.1, Item 4.11 and Table 2.1.1-7, Item 4.11 will be revised to state "Essential equipment required for safe shutdown located in the RB and RBA is located above the internal flood level or is designed to withstand flooding."

- U.S. EPR FSAR Tier 2, Section 3.4.1 and Table 1.8-2 will be revised to include a COL Information Item to perform the internal flooding analyses for the RB and RBA. "A COL applicant that references the U.S. EPR design certification will perform an internal flooding analysis prior to fuel load for the Reactor Building and Reactor Building Annulus to demonstrate that the essential equipment required for safe shutdown is located above the internal flood level or is designed to withstand flooding."

In regard to external flooding, ITAAC will be added to U.S. EPR FSAR Tier 1 to provide additional clarification on water-stops, water tight seals, and waterproofing, as follows:

- U.S. EPR FSAR, Tier 1, Section 2.1.1 and Table 2.1.1-7 will be revised to add Item 4.17 stating: “The portions of NI structures located below grade elevation are protected from external flooding by water-stops, water tight seals, and waterproofing.”

- U.S. EPR FSAR, Tier 1, Section 2.1.2 and Table 2.1.2-2 will be revised to add Item 4.4, “The portions of EPGB structures located below grade elevation are protected from external flooding by water-stops, water tight seals, and waterproofing.”

- U.S. EPR FSAR Tier 1, Section 2.1.5 and Table 2.1.5-2 will be revised to add Item 4.4 stating: “The portions of ESWB structures located below grade elevation are protected from external flooding by water-stops, water tight seals, and waterproofing.”

**FSAR Impact:**

U.S. EPR FSAR, Tier 1, Section 2.1.1, Section 2.1.2, Section 2.1.5, Section 2.5.1, and Section 2.5.2 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 1, Table 2.1.1-6, Table 2.1.1-7, Table 2.1.2-2, Table 2.1.5-2, Table 2.5.1-3, and Table 2.5.2-3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR, Tier 2, Section 3.4.1 and Table 1.8-2 will be revised as described in the response and indicated on the enclosed markup.

# U.S. EPR Final Safety Analysis Report Markups

4.3 The RCB, is designed to retain its pressure boundary integrity associated with the design pressure including the liner plate, maintains its pressure boundary integrity at the design pressure.

03.04.01-7

4.4 The as-installed basic configuration of the NI structures, as described in Section 2.1.1, 1.0 Description and as indicated in Table 2.1.1-1—Separation For Internal Hazards, separates the four SBs and separates the FB from other NI structures so that the impact of internal hazards including fire, flooding, and high energy line break is contained within the SB or FB of hazard origination.

4.5 The components of the NI structures that provide post-accident radiation barriers to support post-accident mitigating actions are as described in Table 2.1.1-2—Post-Accident Radiation Barriers.

4.6 The RSB and the RCB are constructed of reinforced concrete and the RCB is pre-stressed.

4.7 The RBA is separated from the SBs and the FB by barriers, doors, dampers, and penetrations that have a minimum 3-hour fire rating.

4.8 The following are provided for water flow to the in-containment refueling water storage tank (IRWST):

- As shown on Figure 2.1.1-11—Trapezoidal Openings, Weirs, and Trash Racks, RCB rooms which are directly above the IRWST, contain trapezoidal-shaped openings in the floor to allow water flow into the IRWST. The floor openings are protected by weirs and trash racks to provide a barrier against material transport into the IRWST.
- As shown on Figure 2.1.1-12—Wall Openings to IRWST, RCB rooms which are adjacent to the IRWST contain wall openings slightly above the floor to allow water flow into the IRWST.

4.9 Essential SSCsSSC in RCB rooms listed in Table 2.1.1-4—RCB Rooms With Pipe Whip Restraints are protected from the dynamic effects of pipe breaks.

4.10 Guard pipes are placed around high energy pipelines that pass through RBA penetrations so that consequential failures to other safeguard systems cannot occur. RBA penetrations containing high energy pipelines are described in Table 2.1.1-5—RBA Penetrations that Contain High Energy Pipelines.

03.04.01-7

4.11 Essential equipment required for safe shutdown located in the RB and RBA is located above the internal flood level or is designed to withstand flooding.Safety related SSCsSSC in the RBA are located above the structural flood design elevation 0 feet 0 inches to protect them from the effects of flooding.

4.12 DeletedAbove elevation 0 feet, 0 inches of the SBs, flooding pits and flood relief panels, as described in Table 2.1.1-6—SBs Flooding Pits and Relief Panels, provide for water flow to lower building levels or outside to prevent water ingress into adjacent divisions.

4.13 DeletedRooms within the SBs and the FB below elevation 0 feet, 0 inches are provided with sufficient interconnections to keep the maximum released water volume stored within the affected division.

4.14 To provide adequate radiological protection, the Spent Fuel Storage Pool (SFSP) has a depth of 47 feet 3 inches as measured from the bottom of the SFSP to the fuel pool floor.

4.15 A pipe break hazards analyses summary exists that concludes the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power.

03.04.01-7

4.16 The reactor pressure vessel, reactor coolant pumps, pressurizer, steam generators, and interconnecting RCS piping are insulated with reflective metallic insulation.

4.17 The portions of the NI structures located below grade elevation are protected from external flooding by waterstops, water tight seals, and waterproofing.

## 5.0 Interface Requirements

There are no interface requirements for the NI Structures.

## 6.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.1-7— lists the NI ITAACNuclear Island Inspections, Tests, Analyses, and Acceptance Criteria specifies the inspections, tests, analyses, and associated acceptance criteria for the NI.

| Table 2.1.1-5—RBA Penetrations that Contain High Energy Pipelines (2 Sheets) | | |
|---|---|---|
| **KKS** | **Penetration** | **Description** |
| LCQ | JMK60BQ019 | Steam Generator Blowdown System |
| LCQ | JMK60BQ205 | Steam Generator Blowdown System |

03.04.01-7

| Table 2.1.1-6—DeletedSBs Flooding Pits and Relief Panels | | | | |
|---|---|---|---|---|
| **NI Structure** | **From Room [KKS]** | **To Room [KKS]** | **Description** | **Elevation** |
| SB 1 | 1UJH10 001 | 1UJH10 001 | Flooding Pit | 0' 0" |
| | 1UJK26 028 | 1UJK26 041 | Relief Panel | 55' 1½" |
| SB 2 | 2UJH10 003 | 2UJH10 003 | Flooding Pit | 0' 0" |
| SB 3 | 3UJH10 003 | 3UJH10 003 | Flooding Pit | 0' 0" |
| SB 4 | 4UJH10 001 | 4UJH10 001 | Flooding Pit | 0' 0" |
| | 4UJK26 028 | 4UJK26 038 | Relief Panel | 55' 1½" |

03.04.01-7

**Table 2.1.1-7—Nuclear Island Inspections, Tests, Analyses, and Acceptance CriteriaITAAC (579 Sheets)**

| | Commitment Wording | Inspections, Tests, or AnalysisAnalyses | Acceptance Criteria |
|---|---|---|---|
| 4.4 | The as-installed basic configuration of the NI structures, as described indicated in Section 2.1.1 and Table 2.1.1-1, separates the four SBs and separates the FB from other NI structures so that the impact of internal hazards is contained in the SB or FB of hazard origination. | (a) An inspection of the as-installed basic configuration of the NI structures will be performed.<br>(b) Fire protection Aanalyses will be performed.<br>(c) Inspection of fire barriers, doors, dampers and penetrations that separate the four SBs and that separate the FB from other NI structures will be performed.<br>(d) Testing of dampers that separate the four SBs and that separate the FB from other NI structures will be performed.<br>(e) An fire protection analysis will be performed. | (a) The as-installed basic configuration of the NI structures provides separation as described in Table 2.1.1-1.<br>(b) Completion of fire protection analysis that indicates barriers, doors, dampers, and penetrations that separate the four SBs and that separates the FB from other NI structures have a minimum 3-hour fire rating and mitigate the propagation of smoke to the extent that safe shutdown is not adversely affected.<br>(c) The as-built configuration of fire barriers, doors, dampers and penetrations that separate the four SBs and that separate the FB from other NI structures agrees with construction drawings.<br>(d) Dampers close.<br>(e) Completion of the post-fire safe shutdown analysis indicates that at least one success path comprised of the minimum set of SSC is available for safe shutdown. |

03.04.01-7

**Table 2.1.1-7—Nuclear Island ~~Inspections, Tests, Analyses, and Acceptance Criteria~~ITAAC (~~5~~79 Sheets)**

| | Commitment Wording | Inspections, Tests, ~~or Analysis~~Analyses | Acceptance Criteria |
|---|---|---|---|
| | | (f) An internal flooding analysis for the SBs will be performed. | (f) Completion of the internal flooding analysis for the SBs indicates that the impact of internal flooding is contained within the SB of origin. |
| | | (g) A walk down of the SB features identified in the internal flooding analysis that maintain the impact of the internal flooding to the SB of origin will be performed. | (g) The SB flood protection features that maintain the impact of internal flooding to the SB of origin are installed. |
| | | (h) An internal flooding analysis for the FB will be performed. | (h) Completion of the internal flooding analysis for the FB indicates that the impact of internal flooding is contained within the FB division of origin. |
| | | (i) A walk down of the FB features identified in the internal flooding analysis that maintain the impact of the internal flooding to the FB division of origin will be performed. | (i) The FB flood protection features that maintain the impact of internal flooding to the FB division of origin are installed. |
| 4.5 | The NI structures include barriers for post-accident radiation shielding, as described in Section 2.1.1 and in Table 2.1.1-2. | An inspection of the as-installed NI accident radiation barriers will be performed. | The as-installed NI structures barriers that provide post-accident radiation shielding are as described in Table 2.1.1-2. |
| 4.6 | As described in Section, 2.1.1, the RSB and RCB are constructed of reinforced concrete and the RCB is pre-stressed. | Inspection of the RSB and RCB ~~construction records~~ as-installed conditions will be performed. | The RSB and RCB are constructed of reinforced concrete and the RCB is pre-stressed. |

03.04.01-7

**Table 2.1.1-7—Nuclear Island Inspections, Tests, Analyses, and Acceptance CriteriaITAAC (579 Sheets)**

| | Commitment Wording | Inspections, Tests, or AnalysisAnalyses | Acceptance Criteria |
|---|---|---|---|
| 4.10 | As described in Section 2.1.1, RBA penetrations that contain high energy pipelines have guard pipes, as described in Table 2.1.1-5. | Inspection of the RBA will be performed. | RBA penetrations that contain high energy pipelines have guard pipes, as described in Table 2.1.1-5. |
| 4.11 | Essential equipment required for safe shutdown located in the RB and RBA is located above the internal flood level or is designed to withstand flooding.As described in Section 2.1.1, safety-related SSCsSSC in the RBA are located above the structural design flooding level elevation. | (a) An internal flood analysis for the RB and RBA will be performed.Inspection of the RBA will be performed.<br><br>(b) A walk down of the essential equipment in the RB and RBA required for safe shutdown will be performed. | (a) Completion of the internal flood analysis for the RB and RBA indicates essential equipment required for safe shutdown is located above the internal flood level or is designed to withstand flooding. Safety-related SSCsSSC in the RBA are located above elevation 0' 0".<br><br>(b) Essential equipment in the RB and RBA required for safe shutdown is located above the internal flood level or is designed to withstand flooding. |
| 4.12 | As described in Section 2.1.1, above elevation 0' 0" of the SBs, flooding pits and flood relief panels provide for water flow to lower building levels or outside. Deleted | Inspection of the SBs will be performed. Deleted | The as-installed SBs configuration includes flooding pits and flood relief panels as described in Table 2.1.1-6. Deleted |
| 4.13 | DeletedAs described in Section 2.1.1, rooms within the SBs and the FB below elevation 0' 0" are provided with sufficient interconnections to keep the maximum released water volume stored within the affected division. | (a) An analysis will be performed. Deleted | (a) Completion of analysis that indicates rooms within the SBs and the FB below elevation 0' 0" are provided with sufficient interconnections to keep the maximum released water volume stored within the affected division. Deleted |

03.04.01-7

**Table 2.1.1-7—Nuclear Island ~~Inspections, Tests, Analyses, and Acceptance Criteria~~ITAAC (~~5~~79 Sheets)**

| | Commitment Wording | Inspections, Tests, ~~or~~ ~~Analysis~~Analyses | Acceptance Criteria |
|---|---|---|---|
| | | ~~(b) An inspection of the SBs and FB will be performed.~~ Deleted | ~~(b) The as-built configuration of SBs and FB interconnections, to keep the maximum released water volume stored below elevation 0' 0", agrees with construction drawings.~~ Deleted |
| 4.14 | As described in Section 2.1.1, the SFSP has a depth of 47' 3". | An inspection of the SFP will be performed. | The as-built SFSP has a depth of 47' 3" as measured from the bottom of the SFSP to the fuel pool floor. |
| 4.15 | A pipe break hazards analyses summary exists that concludes the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power. | A pipe break hazards analysis will be performed. | A pipe break hazards analyses summary exists that concludes the plant can be shut down safely and maintained in cold safe shutdown following a pipe break with loss of offsite power and confirms whether:<br>• Piping stresses in the containment penetration area are within allowable stress limits.<br>• Pipe whip restraints and jet shield designs can mitigate pipe break loads.<br>• Loads on safety-related SSC are within design load limits.<br>• SSC are protected or qualified to withstand the environmental effects of postulated failures. |
| 4.16 | The reactor pressure vessel, reactor coolant pumps, pressurizer, steam generators, and interconnecting RCS piping are insulated with reflective metallic insulation. | An inspection will be performed. | The reactor pressure vessel, reactor coolant pumps, pressurizer, steam generators, and interconnecting RCS piping are insulated with reflective metallic insulation. |

03.04.01-7

| Table 2.1.1-7—Nuclear Island ~~Inspections, Tests, Analyses, and Acceptance Criteria~~ITAAC (~~5~~79 Sheets) | | | |
|---|---|---|---|
| | **Commitment Wording** | **Inspections, Tests, ~~or Analysis~~Analyses** | **Acceptance Criteria** |
| 4.17 | The portions of the NI structures located below grade elevation are protected from external flooding by waterstops, water tight seals, and waterproofing. | An walkdown of the NI structures will be performed. | The portions of the NI structures located below grade elevation are protected from external flooding by waterstops, water tight seals, and waterproofing. |

## 4.0 Mechanical Design Features, Seismic 1E Classifications

4.1 The EPGBs site grade level is at elevation 0 feet 1 foot 0 inches, as indicated on Figure 2.1.2–2—Emergency Power Generating Building - View 1 and Figure 2.1.2–3—Emergency Power Generating Building - View 2.

4.2 The EPGBs are separated to address internal hazards, including fire and flood as described in Table 2.1.2–1—EPGB Separation for Internal Hazards.

4.3 The EPGBs as-installed basic configuration structural supports are Seismic Category I and are designed and constructed to withstand design basis loads without loss of structural integrity and safety-related functions. The design bases loads are those loads associated with the following:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, hydrostatic loads, hydrodynamic loads, and temperature loads).
- Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads – including reaction loads, jet impingement loads, and missle impact loads).
- External events (including rain, snow, flood, tornado, tornado-generated missiles, and earthquake).

4.4 The portions of EPGB structures located below grade elevation are protected from external flooding by waterstops, water tight seals and waterproofing.

03.04.01-7

## 5.0 Interface Requirements

There are no interface requirements for the EPGBs.

## 6.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.2–2— lists the EPGB ITAACEmergency Power Generating Building Inspections, Tests, Analyses, and Acceptance Criteria specifies the inspections, tests, analyses, and associated acceptance criteria for the EPGBs.

**Table 2.1.2–2—Emergency Power Generating Building Inspections, Tests, Analyses, and Acceptance CriteriaITAAC (2 PagesSheets)**

| | Commitment Wording | Inspections, Tests, or AnalysisAnalyses | Acceptance Criteria |
|---|---|---|---|
| 2.1 | The as-installed location of the EPGBs is as described in Section 2.1.2 and as shown on Figure 2.1.2-1. | An inspection of the EPGBs will be performed. | The as-installed location of the EPGBs is as shown on Figure 2.1.2-1. |
| 3.1 | Physical separation of the as-installed EPGBs is as described in Section 2.1.2 and as shown on Figure 2.1.2-1. | An inspection of the EPGBs will be performed. | The as-installed EPGBs are separated by the NI complex as shown on Figure 2.1.2-1. |
| 4.1 | The EPGBs as-installed site grade level, as described in Section 2.1.2, is at elevation 0'-1'-0" as indicated on Figures 2.1.2-2 and 2.1.2-3. | An inspection of EPGBs site grade level will be performed. | The as-installed EPGBs site grade level is at elevation 0'-1'-0" as indicated on Figures 2.1.2-2 and 2.1.2-3. |
| 4.2 | As described in Section 2.1.2, and Table 2.1.2-1, the as-installed configuration of the EPGBs provides for internal hazards barriers. | (a) An inspection of the EPGBs will be performed.<br>03.04.01-7<br>(b) A fire protection analysis will be performed.<br>(c) Inspection of any doors, dampers and penetrations through the barriers listed in Table 2.1.2-1. | (a) The as-installed configuration of the EPGBs provides internal hazards barriers as described in Table 2.1.2-1.<br>(b) Completion of fire protection analysis that indicates that barriers, doors, dampers, and penetrations identified in Table 2.1.2-1 have a minimum 3-hour fire rating and mitigate the propagation of smoke to the extent that safe shutdown is not adversely affected.<br>(c) The as-built configuration of any doors, dampers, and penetrations through the barriers listed in Table 2.1.2-1 agrees with construction drawings. |

**Table 2.1.2–2—Emergency Power Generating Building**
**Inspections, Tests, Analyses, and Acceptance CriteriaITAAC**
**(2 PagesSheets)**

| | Commitment Wording | Inspections, Tests, or AnalysisAnalyses | Acceptance Criteria |
|---|---|---|---|
| 4.3 | The EPGB structures are Seismic Category I and are designed and constructed to withstand design basis loads as specified in Section 2.1.2, without loss of structural integrity and safety-related functions. | (a) Analysis of the EPGB structures for the design basis loads will be performed.<br>(b) An verification inspection of the EPGB structures seismic design analysis versus construction records drawings will be performed. Deviations from the approved design will be analyzed for design basis loads. | (a) The design of the EPGB structures will withstand the design basis loads without loss of structural integrity and safety related functions.<br>(b) EPGB structures conform to the approved design and will withstand the design basis loads specified in Section 2.1.2 without loss of structural integrity and safety-related functions. |
| 4.4 | The portions of EPGB structures located below grade elevation are protected from external flooding by waterstops, water tight seals and waterproofing. | An inspection of the EPGB structures will be performed. | The portions of EPGB structures located below grade elevation are protected from external flooding by waterstops, water tight seals and waterproofing. |

03.04.01-7

Next File

two ESWBs located adjacent to the Turbine Building have five missile protection shields provided for the safety-related fans and pumps; these ESWBs are positioned favorably outside the low-trajectory hazard zone for turbine missiles.

## 4.0 Mechanical Design Features, Seismic 1E Classifications

4.1 The ESWBs site grade level is at elevation 0 -1 feetfoot, 0 inches as indicated on Figures 2.1.5-4 and 2.1.5-5.

03.04.01-7

4.2 ESWBs are separated to address internal fire hazards, including fire and flood as described in Table 2.1.5-1—ESWB Separation For Internal Hazards.

4.3 The ESWBs as installed basic configuration structural supports are Seismic Category I and are designed and constructed to withstand design basis loads without loss of structural integrity and safety-related functions. The design basis loads are those loads associated with:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, hydrostatic loads, hydrodynamic loads, and temperature loads).
- Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reactions, and pipe break loads – including reaction loads, jet impingement loads, and missle impact loads).

03.04.01-7

- External events (including rain, snow, flood, tornado, tornado-generated missiles, and earthquake).

4.4 The portions of ESWB structures located below grade elevation are protected from external flooding by waterstops, water tight seals and waterproofing.

## 5.0 Interface Requirements

There are no interface requirements for the ESWB structures.

## 6.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.5-2— lists the ESWB ITAACEssential Service Water Building Inspections, Tests, Analyses, and Acceptance Criteria (2 Sheets) specifies the inspections, tests, analyses, and associated acceptance criteria for the ESWBs.

**Table 2.1.5-2—Essential Service Water Building ~~Inspections, Tests, Analyses, and Acceptance Criteria~~ITAAC**

| | Commitment Wording | Inspections, Tests, ~~or Analysis~~Analyses | Acceptance Criteria |
|---|---|---|---|
| 2.1 | The as-installed basic configuration of the four ESWBs is as shown on Figure 2.1.5-1. | An inspection of the ESWBs will be performed. | The as-installed configuration of the ESWBs is that there are four separate ESWBs as shown on Figure 2.1.5-1. |
| 3.1 | As shown in Figure 2.1.5-1, physical separation of the two pairs of ESWBs is provided by the NI complex. | An inspection of the ESWBs will be performed. | The as-installed configuration of the ESWBs is that the two pairs of ESWBs are separated by the NI complex as shown on Figure 2.1.5-1. |
| 3.2 | Two of the ESWBs have missile protection shields provided for the safety-related fans and pumps as shown on Figures 2.1.5-2, 2.1.5-3, 2.1.5-4, and 2.1.5-5. | An inspection of the ESWBs will be performed. | The as-installed configuration of the ESWB's includes five missile protection shields for each ESWB located adjacent to the turbine building as shown on Figures 2.1.5-2, 2.1.5-3, 2.1.5-4, and 2.1.5-5. |
| 4.1 | The ESWBs site grade level is at elevation ~~0'~~ -1' 0" as shown on Figures 2.1.5-4 and 2.1.5-5. | An inspection of the ESWBs site grade level will be performed. | The as-installed ESWB site grade level is at elevation ~~0'~~ -1' 0" as shown on Figures 2.1.5-4 and 2.1.5-5. |
| 4.2 | ESWBs are separated to address ~~internal~~ fire hazards, ~~including fire and flood~~ as described in Table 2.1.5-1 | An inspection of the ESWBs will be performed. | The as-installed configuration of the ESWBs provides internal ~~hazards~~ fire barriers as described in Table 2.1.5-1 |
| 4.3 | The ESWB structures are Seismic Category I and are designed and constructed to withstand design basis loads as specified in Section 2.1.5, without loss of structural integrity and safety-related functions. | a. Analysis of the ESWB structures for the design basis loads will be performed.<br>b. A verification inspection of the ESWB structures ~~seismic~~ design analysis versus ~~construction records~~ as-installed conditions will be performed. Deviations from the approved design due to as-installed conditions will be analyzed for design basis loads. | a. The design of the ESWB structures will withstand the design basis loads without loss of structural integrity and safety related functions.<br>b. ESWB structures conform to the approved design and withstand the design basis loads specified in Section, 2.1.5, without loss of structural integrity and safety-related functions. |

03.04.01-7

**Table 2.1.5-2—Essential Service Water Building Inspections, Tests, Analyses, and Acceptance CriteriaITAAC**

| | Commitment Wording | Inspections, Tests, or AnalysisAnalyses | Acceptance Criteria |
|---|---|---|---|
| 4.4 | The portions of ESWB structures located below grade elevation are protected from external flooding by waterstops, water tight seals and waterproofing. | An inspection of the ESWB structures will be performed. | The portions of ESWB structures located below grade elevation are protected from external flooding by waterstops, water tight seals and waterproofing. |

03.04.01-7

## 2.5 Electrical Power

### 2.5.1 Class 1E Emergency Power Supply System

### 1.0 Description

The emergency power supply system (EPSS) provides electrical power for systems that are essential to reactor shutdown, containment isolation and heat removal, reactor core cooling, and preventing a significant release of radioactive material to the environment. The EPSS distributes power to safety-related and non-safety-related plant loads during normal and abnormal operations.

EPSS divisions are independent and physically separated during normal bus alignments. An alternate feed is provided between EPSS divisions 1 and 2, and between divisions 3 and 4 to provide the normal and standby source of power to required safety systems, safety support systems, or components that do not have the required redundancy when certain electrical components, including emergency diesel generators, are out of service. With an alternate feed installed, independence is maintained between the EPSS divisions with the alternate feed installed and the divisions without an alternate feed installed. The divisions without the alternate feed installed are independent of each other.

### 2.0 Arrangement

2.1 The functional arrangement of EPSS equipment is shown in Figure 2.5.1-1—Class 1E Emergency Power Supply System Functional Arrangement.

2.2 Equipment identified as Class 1E in Table 2.5.1-2—Class 1E Emergency Power Supply System Electrical Equipment Design are located as listed in Table 2.5.1-1—Class 1E Emergency Power Supply System Electrical Equipment Location.

2.3 There are four EPSS divisions.

2.4 Equipment identified as Class 1E in Table 2.5.1-2 and located in a Safeguard Building as indicated in Table 2.5.1-1 are located above elevation 0' 0".

03.04.01-7

### 3.0 Mechanical Design Features, Electrical and Seismic Classifications

3.1 Equipment listed as Class 1E in Table 2.5.1-2 are qualified as Seismic Category I and can withstand seismic design basis loads without loss of safety function.

### 4.0 I&C Design Features, Alarms, Displays and Controls

4.1 Displays listed in Table 2.5.1-2 are retrievable in the main control room (MCR) and remote shutdown station (RSS) as listed in Table 2.5.1-2.

4.2 EPSS equipment controls are provided in the MCR and RSS as listed in Table 2.5.1-2.

### 5.0 Electrical Considerations

5.1 Physical separation exists between EPSS Class 1E equipment listed in Table 2.5.1-2 and non-Class 1E equipment.

**Table 2.5.1-3—Class 1 E Emergency Power Supply System ~~Inspections, Tests, Analyses, and Acceptance Criteria~~ITAAC (6 Sheets)**

| Commitment Wording | | Inspections, Tests, ~~or Analysis~~ Analyses | Acceptance Criteria |
|---|---|---|---|
| 2.1 | The functional arrangement of the EPSS is as shown on Figure 2.5.1-1. | An inspection will be performed. | The as-built EPSS conforms to the functional arrangement as shown in Figure 2.5.1-1. |
| 2.2 | Equipment identified as Class 1E in Table 2.5.1-2 is located as listed in Table 2.5.1-1. | An inspection will be performed. | The equipment listed as Class 1E in Table 2.5.1-2 is located as indicated in Table 2.5.1-1. |
| 2.3 | There are four EPSS divisions. | An inspection will be performed. | The EPSS has four divisions. |
| 2.4 | Equipment identified as Class 1E in Table 2.5.1-2 and located in a Safeguard Building as indicated in Table 2.5.1-1 are located above elevation 0’ 0”. | An inspection will be performed. | Equipment identified as Class 1E in Table 2.5.1-2 and located in a Safeguard Building as indicated in Table 2.5.1-1 are located above elevation 0’ 0”. |
| 3.1 | Equipment listed as Class 1E in Table 2.5.1-2 are qualified as Seismic Category I and can withstand seismic design basis loads without loss of safety function. | ~~a. An inspection will be performed.~~<br>~~b~~a. Type ~~testing~~tests, ~~analysis~~analyses, or a combination of type ~~testing~~ tests and ~~analysis~~ analyses will be performed on the equipment listed as Class 1E in Table 2.5.1-2 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. | ~~a. A report exists and concludes that the equipment designated as Class 1E in Table 2.5.1-2 is installed as designed.~~<br>~~b~~a. Tests/analysis ~~A~~ reports exists and concludes that the equipment listed as Class 1E in Table 2.5.1-2 can withstand seismic design basis loads without loss of safety function. |

03.04.01-7

## 2.5.2 Class 1E Uninterruptible Power Supply

### 1.0 Description

The Class 1E uninterruptible power supply (EUPS) system provides Class 1E power to safety-related, dc loads, and uninterruptible ac power to safety-related and select non-safety-related loads during normal and abnormal operations.

### 2.0 Arrangement

2.1 The functional arrangement of EUPS equipment is shown in Figure 2.5.2-1—Class 1E Uninterruptible Power Supply System Functional Arrangement.

2.2 Equipment identified as Class 1E in Table 2.5.2-2—Class 1E Uninterruptible Power Supply Electrical Equipment Design are located as listed in Table 2.5.2-1—Class 1E Uninterruptible Power Supply System Electrical Equipment Location.

03.04.01-7

2.3 There are four EUPS divisions.

2.4 Equipment identified as Class 1E in Table 2.5.2-2 and located in a Safeguard Building as indicated in Table 2.5.2-1 are located above elevation 0’ 0”.

### 3.0 Mechanical Design Features, Electrical and Seismic Classifications

3.1 Equipment listed as Class 1E in Table 2.5.2-2 are qualified as Seismic Category I and can withstand seismic design basis loads without loss of safety function.

### 4.0 I&C Design Features, Alarms, Displays and Controls

4.1 Displays listed in Table 2.5.2-2 are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.5.2-2.

### 5.0 Electrical Considerations

5.1 Physical separation exists between EUPS Class 1E equipment listed in Table 2.5.2-2 and non-Class 1E equipment.

5.2 There is electrical isolation between ~~Non~~non-safety-related loads connected to the EUPS (e.g., post accident monitoring and special emergency lighting) ~~are separated by a~~and EUPS Class 1E ~~isolation device~~components.

5.3 Without an emergency power supply system (EPSS) alternate feed installed, independence is maintained between the four EUPS divisions.

5.4 With the alternate feed installed from EPSS division 1 to division 2; independence is maintained between the load group created by EUPS divisions 1 and 2, and divisions 3 and 4. EUPS divisions 3 and 4 are independent of each other.

5.5 With the alternate feed installed from EPSS division 2 to division 1; independence is maintained between the load group created by EUPS divisions 1 and 2, and divisions 3 and 4. EUPS divisions 3 and 4 are independent of each other.

**Table 2.5.2-3—Class 1E Uninterruptible Power Supply**
**~~Inspections, Tests, Analyses, and Acceptance Criteria~~ITAAC**
**(~~4~~ 5 Sheets)**

| Commitment Wording | | Inspections, Tests, ~~or Analysis~~ Analyses | Acceptance Criteria |
|---|---|---|---|
| 2.1 | The functional arrangement of the EUPS is as shown on Figure 2.5.2-1. | An inspection will be performed. | The as-built EUPS conforms to the functional arrangement as shown in Figure 2.5.2-1. |
| 2.2 | Equipment identified as Class 1E in Table 2.5.2-2 is located as listed in Table 2.5.2-1. | An inspection will be performed. | The equipment listed as Class 1E in Table 2.5.2-2 is located as indicated in Table 2.5.2-1. |
| 2.3 | There are four EUPS divisions. | An inspection will be performed. | The EUPS has four divisions. |
| 2.4 | Equipment identified as Class 1E in Table 2.5.2-2 and located in a Safeguard Building as indicated in Table 2.5.2-1 are located above elevation 0' 0". | An inspection will be performed. | Equipment identified as Class 1E in Table 2.5.2-2 and located in a Safeguard Building as indicated in Table 2.5.2-1 are located above elevation 0' 0". |
| 3.1 | Equipment listed as Class 1E in Table 2.5.2-2 are qualified as Seismic Category I and can withstand seismic design basis loads without loss of safety function. | ~~a. An inspection will be performed.~~<br>~~b~~a. Type ~~testing~~tests, ~~analysis~~analyses, or a combination of type ~~testing~~ tests and ~~analysis~~ analyses will be performed on the equipment listed as Class 1E in Table 2.5.2-2 using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements. | ~~a. A report exists and concludes that the equipment designated as Class 1E in Table 2.5.2-2 is installed as designed.~~<br>~~b~~a. Tests/analysis~~A~~ reports exist~~s~~ and conclude~~s~~ that the equipment listed as Class 1E in Table 2.5.2-2 can withstand seismic design basis loads without loss of safety function. |

03.04.01-7

**Table 1.8-2—U.S. EPR Combined License Information Items**
**Sheet 11 of 44**

| Item No. | Description | Section | Action Required by COL Applicant | Action Required by COL Holder |
|---|---|---|---|---|
| 3.3-2 | A COL applicant that references the U.S. EPR design certification will demonstrate that failure of site-specific structures or components not included in the U.S. EPR standard plant design, and not designed for wind loads, will not affect the ability of other structures to perform their intended safety functions. | 3.3.1 | Y | |
| 3.3-3 | A COL applicant that references the U.S. EPR design certification will demonstrate that failure of site-specific structures or components not included in the U.S. EPR standard plant design, and not designed for tornado loads, will not affect the ability of other structures to perform their intended safety functions. | 3.3.2 | Y | |
| 3.4-1 | A COL applicant that references the U.S. EPR design certification will confirm the potential site specific external flooding events are bounded by the U.S. EPR design basis flood values or otherwise demonstrate that the design is acceptable. | 3.4.3.2 | Y | |
| 3.4-2 | A COL applicant that references the U.S. EPR design certification will perform a flooding analysis for the ultimate heat sink makeup water intake structure based on the site-specific design of the structures and the flood protection concepts provided herein. | 3.4.3.10 | Y | |
| 3.4-3 | A COL applicant that references the U.S. EPR design certification will define the need for a site-specific permanent dewatering system. | 3.4.3.11 | Y | |
| 3.4-4 | A COL applicant that references the U.S. EPR design certification will perform internal flooding analyses prior to fuel load for the Safeguard Buildings and Fuel Building to demonstrate that the impact of internal flooding is contained within the Safeguard Building or Fuel Building division of origin. | 3.4.1 | | Y |

03.04.01-7

**Table 1.8-2—U.S. EPR Combined License Information Items**
**Sheet 12 of 44**

03.04.01-7

| Item No. | Description | Section | Action Required by COL Applicant | Action Required by COL Holder |
|---|---|---|---|---|
| 3.4-5 | A COL applicant that references the U.S. EPR design certification will perform an internal flooding analysis prior to fuel load for the Reactor Building and Reactor Building Annulus to demonstrate that the essential equipment required for safe shutdown is located above the internal flood level or is designed to withstand flooding. | 3.4.1 | | Y |
| 3.5-1 | A COL applicant that references the U.S. EPR design certification will describe controls to confirm that compressed gas cylinders and unsecured maintenance equipment, including that required for maintenance and that are undergoing maintenance, will be removed from ~~containment~~safety-related building areas prior to operation, moved to a location where it is not a potential hazard to ~~SSCs~~SSC important to safety, or seismically restrained to prevent it from becoming a missile. | 3.5.1.2.3<br>3.5.1.1.3 | Y | |
| 3.5-2 | A COL applicant that references the U.S. EPR design certification will confirm the evaluation of the probability of turbine missile generation for the selected turbine generator, P1, is less than 1 x $10^{-4}$ for turbine-generators favorably oriented with respect to containment. | 3.5.1.3 | Y | |
| 3.5-3 | A COL applicant that references the U.S. EPR design certification will assess the effect of potential turbine missiles from turbine generators within other nearby or co-located facilities. | 3.5.1.3 | Y | |
| 3.5-4 | A COL applicant that references the U.S. EPR design certification will evaluate the potential for other missiles generated by natural phenomena, such as hurricanes and extreme winds, and their potential impact on the missile protection design features of the U.S. EPR. | 3.5.1.4 | Y | |

## 3.4 Water Level (Flood) Design

In accordance with GDC 2 and RG 1.29, the Seismic Category I structures, systems, and components (SSCsSSC) identified in Section 3.2Table 3.2.2-1 can withstand the effects of flooding due to natural phenomena or onsite equipment failures, without losing the capability to perform their safety-related functions. A description of these structures is provided in Section 3.8. The U.S. EPR design meets the requirements of GDC 4 because safety-related SSCsSSC accommodate the effects of discharged fluid resulting from the high- and moderate-energy line breaks postulated in Sections 3.6.1 and 3.6.2 The criteria in RG 1.59 and ANSI/ANS-2.8-1992 “Determining Design Basis Flooding at Power Reactor Sites” (Reference 1) are used to establish the probable maximum flood (PMF), probable maximum precipitation (PMP), seiche, and other hydrologic considerations. The flood protection measures for Seismic Category I SSCsSSC are designed in accordance with RG 1.102. Section 2.4 provides further information on hydrologic engineering. Section 2.5 provides information on safe shutdown earthquake ground motion. Section 3.8 provides information on the design of Seismic Category I structures. The risk assessment for external and internal flooding is provided in the U.S. EPR probabilistic risk assessment addressed in Chapter 19.

### 3.4.1 Internal Flood Protection

The U.S. EPR includes measures for protecting safety-related SSCsSSC against the effects of internal flooding from postulated flooding sources. These measures also protect safety-related SSCsSSC from flooding from non safety-related SSCsSSC that are not required to be protected from either internal or external flooding. Because of these measures, a failure of components due to an internal flooding event will not prevent safe shutdown of the plant or mitigation of the flooding event. The nuclear island general arrangement drawings in Section 3.8 are a useful reference for the following description of protective measures for internal flooding.

03.04.01-7

The principal protective measure for Seismic Category I buildings is physical separation of the redundant safe shutdown systems and components. The plant arrangement provides divisional separation walls to physically separate the redundant trains of safe shutdown systems and components. A combination of fluid diversion flow paths and passive features contain the water within the affected division. A COL applicant that references the U.S. EPR design certification will perform internal flooding analyses prior to fuel load for the Safeguard Buildings and Fuel Building to demonstrate that the impact of internal flooding is contained within the Safeguard Building or Fuel Building division of origin. Features credited in the analysis will be verified by walk-down.

Division walls below elevation +0 feet, 0 inches (hereinafter +0 feet) provide separation and serve as flood barriers to prevent flood waters spreading to adjacent divisions. These division walls are watertight, have no doors, and a minimal number of penetrations. Water is directed within one division to the building elevations below +0 feet, where it is stored. Above elevation +0 feet, a combination of watertight doors and openings for water flow to the lower building levels prevent water ingress into adjacent divisions. Watertight doors have position indicators for control of the closed position. Existing openings (e.g., stair cases, elevator shafts, and building drains) are credited as water flow paths when available. Flooding pits with burst openings collect and direct water flow to lower building levels. Rooms within divisions have interconnections so that the maximum released water volume can be distributed and stored in the lower building levels of the affected division. Interconnections include doors with flaps, wall openings, and other wall penetrations that are not required to be sealed. Elevated thresholds, curbs, and pedestals are provided as necessary.

03.04.01-7

In Seismic Category I structures that are not designed with divisional separation, e.g., the Reactor Building (RB), the layout allows water released inside the building to flow to the lower level of the building. In the RB, water flows down to the in-containment refueling water storage tank (IRWST). In the annulus, water flows to the bottom level where it is stored. Safety-related systems and components in these structures are located above the maximum water level, protecting them from the effects of flooding. A COL applicant that references the U.S. EPR design certification will perform an internal flooding analysis prior to fuel load for the Reactor Building and Reactor Building Annulus to demonstrate that the essential equipment required for safe shutdown is located above the internal flood level or is designed to withstand flooding. Locations of essential SSC and features provided to withstand flooding will be verified by walk-down.

Leak detection and isolation measures mitigate the consequences of postulated pipe ruptures. Water level instrumentation and other leak detection measures detect pipe ruptures that could result in internal flooding. These leak detection systems provide a signal to automatically isolate the affected system or to provide indication to the main control room (MCR) to initiate operator action from within the MCR or locally. Section 3.6 provides further information on protection mechanisms associated with the postulated rupture of piping.

The nuclear island drain and vent system (NIDVS) prevents backflow of water from affected areas of the plant that contain safety-related equipment. The NIDVS is conservatively considered not available for reducing water volume by the respective sump pumps.

### 3.4.2 External Flood Protection

The Seismic Category I ~~SSCs~~SSC listed in Section 3.2 can withstand the effects of external flooding due to natural phenomena and postulated component failures.