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February 3, 2022

GO2-22-001 10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397 LICENSE AMENDMENT REQUEST TO ADOPT TSTF-505, REVISION 2, "PROVIDE RISK-INFORMED EXTENDED COMPLETION TIMES – RITSTF INITIATIVE 4b"**

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Energy Northwest is requesting an amendment to the Technical Specifications (TS) of the Columbia Generating Station (Columbia).

The proposed amendment would modify TS requirements to permit the use of Risk Informed Completion Times in accordance with TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b" (ADAMS Accession No. ML18183A493). A model safety evaluation with Limitations and Conditions was provided by the Nuclear Regulatory Commission (NRC) to the TS Task Force (TSTF) on November 21, 2018 (ADAMS Accession No. ML18253A085).

- Attachment 1 provides a description and assessment of the proposed change, the requested confirmation of applicability, and plant-specific verifications.
- Attachment 2 provides the existing TS pages marked up to show the proposed changes.
- Attachment 3 provides existing TS Bases pages marked up to show the proposed changes and is provided for information only.
- Attachment 4 provides a cross-reference between the TS included in TSTF-505, Revision 2, and the Columbia plant-specific TS.
- Attachment 5 provides a list of implementations items that must be completed prior to implementing the Risk-Informed Completion Time Program at Columbia.

- Attachment 6 provides information supporting the redundant means available to mitigate accidents for instrumentation governed by the TS proposed to be included as part of the RICT program in this submittal.

Energy Northwest requests approval of the proposed license amendment by 3/31/2023, with the NRC-approved amendment being implemented within 180 days.

In accordance with 10 CFR 50.91, Energy Northwest is notifying the State of Washington of this amendment request by transmitting a copy of this letter and attachments and enclosures to the designated State Official.

This letter and its attachments and enclosures contain no regulatory commitments.

If there are any questions regarding this submittal, please contact Mr. R. M. Garcia, Licensing Supervisor, at (509) 377-8463.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 3rd day of February 2022.

Respectfully,

DocuSigned by:
J Kent Dittmer
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J. Kent Dittmer
Vice President, Engineering

Attachments:
1. Description and Assessment
2. Proposed Technical Specification Changes (Mark-Up)
3. Proposed Technical Specification Bases Changes (Mark-Up) – For Information Only
4. Cross-Reference of TSTF-505 and Columbia Generating Station Technical Specifications
5. Columbia Generating Station RICT Program PRA Implementation Items
6. Evaluation of Instrumentation and Control Systems

Enclosures:
1. List of Revised Required Actions to Corresponding PRA Functions
2. Information Supporting Consistency with Regulatory Guide 1.200, Revision 2
3. Information Supporting Technical Adequacy of PRA Models Without PRA Standards Endorsed by Regulatory Guide 1.200, Revision 2

4. Information Supporting Justification of Excluding Sources of Risk Not Addressed by the PRA Models
5. Baseline CDF and LERF
6. Justification of Application of At-Power PRA Models to Shutdown Modes
7. PRA Model Update Process
8. Attributes of the Real-Time Model
9. Key Assumptions and Sources of Uncertainty
10. Program Implementation
11. Monitoring Program
12. Risk Management Action Examples

cc: NRC RIV Regional Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
CD Sonoda – BPA/1399
EFSECutc.wa.gov – EFSEC
E Fordham – WDOH
R Brice – WDOH
L Albin – WDOH

Attachment 1
Description and Assessment

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DESCRIPTION AND ASSESSMENT

1.0 DESCRIPTION

The proposed amendment would modify the Technical Specification (TS) requirements related to Completion Times (CTs) for Required Actions to provide the option to calculate a longer, risk-informed CT (RICT). A new program, the Risk-Informed Completion Time Program, is added to TS Section 5.0, Administrative Controls.

The methodology for using the RICT Program is described in NEI 06-09-A, "Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines," Revision 0, which was approved by the NRC on May 17, 2007 (Reference 1). Adherence to NEI 06-09-A is required by the RICT Program.

The proposed amendment is consistent with TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b” (Reference 2). However, only those Required Actions described in Attachment 4 and Enclosure 1, as reflected in the proposed TS mark-ups provided in Attachments 2 and 3, are proposed to be changed. This is because some of the modified Required Actions in TSTF-505 are not applicable to the Columbia Generating Station (Columbia), and there are some plant-specific Required Actions not included in TSTF-505 that are included in this proposed amendment.

2.0 ASSESSMENT

2.1 Applicability of Published Safety Evaluation

Energy Northwest has reviewed TSTF-505, Revision 2, and the model safety evaluation dated November 21, 2018 (Reference 3). This review included the supporting information provided to support TSTF-505 and the safety evaluation for NEI 06-09-A. As described in the subsequent paragraphs, Energy Northwest has concluded that the technical basis is applicable to Columbia and support incorporation of this amendment in the Columbia TS.

2.2 Verifications and Regulatory Commitments

In accordance with Section 4.0, Limitations and Conditions, of the safety evaluation for NEI 06-09-A, the following is provided:

1. Enclosure 1 identifies each of the TS Required Actions to which the RICT Program will apply, with a comparison of the TS functions to the functions modeled in the probabilistic risk assessment (PRA) of the structures, systems and components (SSCs) subject to those actions.

2. Enclosure 2 provides a discussion of the results of peer reviews and self-assessments conducted for the plant-specific PRA models which support the RICT Program, as discussed in Regulatory Guide (RG) 1.200 Section 4.2.

3. Enclosure 3 is not applicable since each PRA model used for the RICT Program is addressed using a standard endorsed by the Nuclear Regulatory Commission.

4. Enclosure 4 provides appropriate justification for excluding sources of risk not addressed by the PRA models.

5. Enclosure 5 provides the plant-specific baseline core damage frequency (CDF) and large early release frequency (LERF) to confirm that the potential risk increases allowed under the RICT Program are acceptable.

6. Enclosure 6 is not applicable since the RICT Program is not being applied to shutdown modes.

7. Enclosure 7 provides a discussion of the Energy Northwest's programs and procedures that will assure the PRA models that support the RICT Program are maintained consistent with the as-built, as-operated plant.

8. Enclosure 8 provides a description of how the baseline PRA model, which calculates average annual risk, is evaluated and modified to assess real-time configuration risk, and describes the scope of, and quality controls applied to the real-time model.

9. Enclosure 9 provides a discussion of how the key assumptions and sources of uncertainty in the PRA models were identified, and how their impact on the RICT Program was assessed and dispositioned.

10. Enclosure 10 provides a description of the implementing programs and procedures regarding the plant staff responsibilities for the RICT Program implementation, including risk management action (RMA) implementation.

11. Enclosure 11 provides a description of the implementation and monitoring program as described in NEI 06-09-A, Section 2.3.2, Step 7.

12. Enclosure 12 provides a description of the process to identify and provide RMAs.

2.3 Optional Variations

Energy Northwest is proposing the following variations from the TS changes described in TSTF-505, Revision 2, or the applicable parts of the NRC staff's model safety evaluation dated November 21, 2018. These options were recognized as acceptable variations in TSTF-505 and the NRC staff's model safety evaluation.

Note that, in a few instances, the Columbia TS utilizes different numbering and titles than the Standard Technical Specifications on which TSTF-505 was based. These differences are administrative and do not affect the applicability of TSTF-505 to the Columbia TS.

Attachment 4 is a cross-reference that provides a comparison between the NUREG-1433, “Standard Technical Specifications, General Electric Plants, BWR/4” (Reference 4), NUREG-1434, “Standard Technical Specifications, General Electric Plants, BWR/6” (Reference 5), and the Columbia Technical Specifications included in this license amendment request. Columbia is a BWR/5 design, its Technical Specifications align with NUREG-1434, with a few exceptions that align with NUREG-1433, as identified in Attachment 4. The attachment includes a summary description of the referenced Required Actions, which is provided for information purposes only and is not intended to be a verbatim description of the Required Actions. The cross-reference in Attachment 4 identifies the following:

1. Columbia Required Actions that have identical numbers to the corresponding NUREG-1433/NUREG-1434 Required Actions are not deviations from TSTF-505, except for administrative deviations (if any) such as formatting. These deviations are administrative with no impact on the NRC's model safety evaluation dated November 21, 2018.

2. Columbia Required Actions that have different numbering than the NUREG-1433/ NUREG-1434 Required Actions are an administrative deviation from TSTF-505 with no impact on the NRC's model safety evaluation dated November 21, 2018.

3. For NUREG-1433/NUREG-1434 Required Actions that are not contained in the Columbia TS, the corresponding TSTF-505 mark-ups for the Required Actions are not applicable to Columbia. This is an administrative deviation from TSTF-505 with no impact on the NRC's model safety evaluation dated November 21, 2018.

4. The model application provided in TSTF-505 includes an attachment for typed, clean-pages (revised) TS pages reflecting the proposed changes. Columbia is not including such an attachment due to the number of TS pages included in this submittal that have the potential to be affected by other unrelated license amendment requests and the straightforward nature of the proposed changes. Providing only mark-ups of the proposed TS changes satisfies the requirements of 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," in that the mark-ups fully describe the changes desired. This is an administrative deviation from TSTF-505 with no impact on the NRC's model safety evaluation dated November 21, 2018.

Because of this deviation, the contents and numbering of the attachments for this amendment request differ from the attachments specified in the model application in TSTF-505.

5. As the proposed Columbia RICT Program is applicable in Modes 1 and 2, Columbia will not adopt changes in TSTF-505 for Required Actions that are only applicable in Modes 3 and below.

6. The model application provided in TSTF-505 includes mark-ups to Completion Times for NUREG-1433/NUREG-1434 in a format using an "OR" Logical Connector followed by "In accordance with the Risk Informed Completion Time Program." Several existing Required Actions have two Completion Times connected by the Logical Connector "AND" in the current Columbia TS. Columbia TS Section 1.2, "Logical Connectors," specifies that Completion Times only use first level logic. Therefore, the proposed markups have been modified for these Required Actions to embed "or in accordance with the Risk Informed Completion Time Program" into the existing Completion Times. This follows Columbia TS Section 1.2 and does not create a second level logic for the Completion Times. This is an administrative deviation from TSTF-505 with no impact on the NRC's model safety evaluation dated November 21, 2018. This administrative deviation is consistent with TS Amendments issued for Exelon’s LaSalle County Station (ML21162A069) and Clinton Power Station (ML21132A288), and Northern States Power Company’s Monticello Generating Plant (ML21148A274).

7. For several TS, as noted in the Attachment 2 TS markups, a Note is added to the proposed statement “OR in accordance with the Risk Informed Completion Time Program” to ensure that a RICT is not applied when the safety function is lost. Under this circumstance, TSTF-505, Revision 2, specifies the addition of a Note that reads “Not applicable when [all] required [channels] are inoperable.” Because the loss of function is dependent upon not only the number of inoperable channels, but also the combination of inoperable channels within the trip system, Columbia has chosen to replace the TSTF-505 Note with a Note which reads “Not applicable when a loss of function occurs,” which accomplishes the intended purpose of the TSTF-505 Note. This is an administrative deviation from TSTF-505 with no impact on the NRC's model safety evaluation dated November 21, 2018. This administrative deviation is consistent with TS Amendments issued for Exelon’s LaSalle County Station (ML21162A069) and Clinton Power Station (ML21132A288), and Northern States Power Company’s Monticello Generating Plant (ML21148A274).

8. Columbia proposes to make two minor editorial changes to the Required Action in the new proposed Example 1.3-8 relative to the Example 1.3-8 provided in TSTF-505, Revision 2. TSTF-505, Revision 2, Example 1.3-8 provides a standard default Condition of “Required Action and associated Completion Time not met,” with a Required Action of “Be in MODE 3 [in 6 hours] AND Be in MODE 5 [in 36 hours].” However, the typical default Required Action found in TS Section 1.3 Examples as well as TS Section 3 Limiting Conditions for Operation (LCOs) is “Be in MODE 3 [in 12 hours] AND Be in MODE 4 [in 36 hours].”

Therefore, as noted in the TS markups in Attachment 2, Columbia proposes to change the Completion Time for the MODE 3 Required Action to 12 hours and to specify MODE 4 rather than MODE 5 in the Required Action of the default Condition in the new proposed Example 1.3-8. These changes are administrative in nature and do not affect the applicability of TSTF-505, Revision 2, to the Columbia TS.

9. TSTF-505, Revision 2, insert for the proposed RICT Program, Item E describes requirements regarding "risk assessment approaches and methods" as it relates to this application. Within this item is the statement that "Methods to assess the risk from extending the Completion Times must be PRA methods used to support this license amendment, or other methods …." Energy Northwest considers the phrase "used to support this license amendment" to be potentially confusing since there is no indication as to which license amendment is being referred to in this paragraph. Therefore, for clarification purposes, Energy Northwest proposes to modify this statement to read “Methods to assess the risk from extending the Completion Times must be PRA methods approved for use with this program in Amendment No. [###], or other methods …."

10. Columbia proposes to delete an expired Note and two expired footnotes as follows:

    a. TS 3.6.1.5 Condition A.1 Completion time contains a footnote allowing a one-time extension of the Completion Time following an RHR pump and motor replacement. This footnote expired on February 28, 2019.
    b. TS 3.6.2.3 Condition A.1 Completion Time contains a footnote allowing a one-time extension of the Completion Time following an RHR pump and motor replacement. This footnote expired on February 28, 2019.
    c. TS 3.8.4 Condition G.1 is modified by a Note allowing a Completion Time of 16 hours. This Completion Time was only applicable until June 30, 2021.

    These changes are administrative in nature and do not affect the applicability of TSTF-505, Revision 2 to the Columbia TS.

11. As previously stated, Columbia is a BWR/5 design, its Technical Specifications align with NUREG-1434, with a few exceptions that align with NUREG-1433. Those exceptions are listed below. For TS LCOs that align with NUREG-1433, the changes proposed align with the TSTF-505 NUREG-1433 markup. Energy Northwest has determined that the application of a RICT for the Columbia TS Actions that align with NUREG-1433 is consistent with TSTF-505, Revision 2, and with the NRC’s model safety evaluation dated November 21, 2018.

- TS 3.3.2.2 – Feedwater and Main Turbine High Water Level Trip Instrumentation. The instrumentation is closest to the BWR/4 standard from NUREG-1433, therefore, it is appropriate to apply the TSTF-505 changes proposed for NUREG-1433.
- TS 3.3.6.1 – Primary Containment Isolation Instrumentation. The instrumentation is closest to the BWR/4 standard from NUREG-1433, therefore, it is appropriate to apply the TSTF-505 changes proposed for NUREG-1433. Differences in numbering of Functions listed in Table 3.3.6.1-1 are administrative in nature and do not affect the applicability of TSTF-505, Revision 2, to the Columbia TS.
- TS 3.6.1.3 – Primary Containment Isolation Valves (PCIVs). The Columbia LCO is closest to the BWR/4 standard from NUREG-1433, therefore, it is appropriate to apply the TSTF-505 changes proposed for NUREG-1433.
- TS 3.6.1.7 – Reactor Building-to-Suppression Chamber Vacuum Breakers. The Columbia LCO is closest to the BWR/4 standard from NUREG-1433, therefore, it is appropriate to apply the TSTF-505 changes proposed for NUREG-1433.
- TS 3.6.1.8 – Suppression Chamber-to-Drywell Vacuum Breakers. The Columbia LCO is closest to the BWR/4 standard from NUREG-1433, therefore, it is appropriate to apply the TSTF-505 changes proposed for NUREG-1433.

12. There are several plant-specific LCOs and associated Required Actions for which Columbia is proposing to apply the RICT Program that are variations from TSTF-505, Revision 2. These TS Actions are identified in Attachment 4 with additional justification provided below.

    - 3.3.8.1 – Loss of Power Instrumentation (LOP).

      LCO: The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be OPERABLE.
      Condition B: As required by Required Actions A.1 and referenced in Table 3.3.8.1.

      Columbia TS 3.3.8.1 Condition B is a plant specific Condition not in the NUREG-1434 Standard TS, and therefore, not in TSTF-505, Revision 2.

      Condition B is entered when any of the following functions do not have the required 2 channels per division operable per Table 3.3.8.1-1:

      - 1.a. Divisions 1 and 2 - 4.16 kV Emergency Bus Undervoltage TR-S Loss of voltage – 4.16 kV Basis;

- 1.b Divisions 1 and 2 - 4.16 kV Emergency Bus Undervoltage TR-S Loss of voltage – Time Delay;
- 2.a. Division 3 - 4.16 kV Emergency Bus Undervoltage Loss of Voltage – 4.16 kV Basis; and
- 2.b Division 3 - 4.16 kV Emergency Bus Undervoltage Loss of Voltage – Time Delay.

Condition B ensures that appropriate actions are taken if multiple, inoperable channels within the same Function result in the loss of voltage initiation capability for a diesel generator (DG}. The unit Class 1E AC electrical power distribution system AC sources consists of the offsite power sources and the DGs. Columbia has three divisional load groups (Divisions 1, 2, and 3), each with an independent 4.16 kV Engineered Safety Feature (ESF) bus and a dedicated DG. The ESF systems of any two of the three divisions provide for the minimum safety functions necessary to shut down the unit and maintain it in a safe shutdown condition. Required Action B.2 allows 24 hours to restore an inoperable channel to OPERABLE status.

As indicated in Table E1-1 of Enclosure 1, the configurations associated with TS 3.3.8.1 Condition B are explicitly modeled in the Columbia PRA, with the exception of function 1.a described above. For function 1.a, a surrogate is used which conservatively fails the function 1.b relays. The PRA success criteria are also described in Enclosure 1. Therefore, TS 3.3.8.1 Condition B meets the requirements for inclusion in the RICT Program.

Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. Loss of initiation capability, and thus inoperability of one or more DGs requires entry into LCO 3.8.1 and associated Required Actions and Completion Times.

Condition C: As required by Required Actions A.1 and referenced in Table 3.3.8.1.

Condition A directs immediate entry into Table 3.3.8.1-1 and Table 3.3.8.1-1 directs entry into Condition C which requires placing the channel in trip within one hour. This combination of Conditions A and C are operationally the same as NUREG-1434 LCO 3.3.8.1 Condition A. Therefore, the application of a RICT to Condition C is considered an administrative variation of TSTF-505.

- TS 3.8.1 – AC Sources – Operating.

  LCO: The following AC electrical power sources shall be OPERABLE:
  a. Two qualified circuits between offsite transmission network and the onsite Class 1E AC Electrical Power Distribution System; and
  b. Three diesel generators (DGs).

  Condition B: One required DG inoperable.

  Required Action B.4.2.1: Establish risk management actions for the alternate AC sources.
  Completion Time B.4.2.1: 72 hours
  <u>AND</u>
  Required Action B.4.2.2 Restore required DG to OPERABLE status.
  Completion Time B.4.2.2: 14 days

  <u>OR</u>

  In Accordance with the Risk Informed Completion Time Program

  Required Actions B.4.1 and B.4.2 are plant specific Required Actions not included in NUREG-1434 and therefore not in TSTF-505. Required Actions B.4.2.1 and B.4.2.2 were added to the Columbia TS per Amendment 197 to provide needed flexibility in performing both corrective and preventative maintenance on the Division 1 and 2 DGs during power operation.

  With regard to Completion Time related to the required Action B.4.2.2, Columbia is proposing to maintain both the previous deterministic 14 day backstop, as well as the back stop resulting from the application of the newly proposed methodology and approach as prescribed in the Risk Informed Completion Time Program. It is noted, this is consistent with TS Amendment issued for Exelon's Clinton Power Station (ML21132A288).

- TS 3.8.4 – DC Sources – Operating.
  LCO: The Division 1, Division 2, and Division 3 DC electrical power subsystems shall be OPERABLE.
  Condition A: One required Division 1 or 2 125 V DC battery charger inoperable
  Condition B: One required Division 3 125 V DC battery charger inoperable.

Condition C: One required Division 1 250 V DC battery charger inoperable
Condition D: One required Division 1 or 2 125 V DC battery inoperable
Condition E: One required Division 3 125 V DC battery inoperable.
Condition F: One required Division 1 250 V DC battery inoperable.

Although Columbia TS 3.8.4 Conditions A through F are plant specific Conditions, in function, scope and attributes, they closely align with and map onto the NUREG-1434 Standard TS. Therefore, TSTF-505, Revision 2, can be applied to these Conditions as detailed below.

The station DC electrical power system provides the AC emergency power system with control power. It also provides both motive and control power to selected safety related equipment.

The 125 V DC electrical system consists of three independent Class 1E DC electrical power subsystems, Divisions 1, 2, and 3. The 250 V DC electrical power system consists of one Class 1E electrical power subsystem, Division 1. Each subsystem consists of a battery, associated battery chargers, and all the associated control equipment and interconnecting cabling.

The Division 1 safety related DC power source consists of one 125 V and one 250 V battery bank and associated full capacity battery chargers. The 250 VDC subsystem has a single full capacity battery charger. The 125 VDC subsystem has two full capacity battery chargers, one of which is normally in service and the other is normally electrically isolated from the distribution system. The Division 2 safety related DC power source consists of a 125 V battery bank and two full capacity chargers, one of which is normally in service and the other is normally electrically isolated from the distribution system. The Division 3 safety related DC power system consists of a 125 V battery bank and one full capacity battery charger.

Each DC electrical power subsystem battery charger has ample power output capacity for the steady state operation of connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger has sufficient excess capacity to restore the battery bank from the design minimum charge to its fully charged state within 24 hours while supplying normal steady state loads. The battery charger is normally in the float-charge mode. Float-charge is the condition in which the charger is supplying the connected loads and the battery cells are receiving adequate current to optimally charge the battery. This assures the internal losses of a battery are overcome and the battery is maintained in a fully charged state.

Condition A, B, or C represent one division with no operable battery charger. The ACTIONS provide a tiered response that focuses on returning the battery to the fully charged state and restoring a fully qualified charger to OPERABLE status in a reasonable time period. Required Action A.1, B.1, or C.1 requires that the battery terminal voltage be restored to greater than or equal to the minimum established float voltage within 2 hours. Required Action A.2, B.2, or C.2 requires that the battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. Required Action A.3, B.3, or C.3 limits the restoration time for the inoperable battery charger to 72 hours.

Conditions A, B, and C align closely with NUREG-1434 LCO 3.8.4, Condition A. NUREG-1434 Condition A applies to one battery charger on one division inoperable, where voltage level and division numbers are not specified. The Columbia Conditions A, B, and C represent this same condition, however, there is a separate Condition specified for Division 1 or 2 125 V DC, Division 3 125 V DC, and Division 1 250 V DC battery chargers. The Columbia Required Actions and Completion Times for Conditions A, B, and C are consistent with those for NUREG-1434 Condition A.

As indicated in Table E1-1 of Enclosure 1, the configurations associated with TS 3.8.4 Conditions A, B, and C are explicitly modeled in the Columbia PRA. The PRA success criteria are also described in Enclosure 1. Therefore, TS 3.8.4 Conditions A, B, and C meet the requirements for inclusion in the RICT Program.

Conditions D, E, or F represent one division with one battery inoperable. With one battery inoperable, the DC bus is being supplied by the OPERABLE battery charger(s). Required Actions D.1, E.1, and F.1 allow 2 hours to restore the battery to OPERABLE.

Conditions D, E, and F align closely with NUREG-1434 LCO 3.8.4, Condition B. NUREG-1434 Condition B applies to one battery on one division inoperable, where voltage level and division numbers are not specified. The Columbia Conditions D, E, and F represent this same condition, however, there is a separate Condition specified for Division 1 or 2 125 V DC, Division 3 125 V DC, and Division 1 250 V DC batteries. The Columbia Required Actions and Completion Times for Conditions D, E, and F are consistent with those for NUREG-1434 Condition B.

As indicated in Table E1-1 of Enclosure 1, the configurations associated with TS 3.8.4 Conditions D, E, and F are explicitly modeled in the Columbia PRA. The PRA success criteria are also described in Enclosure 1. Therefore, TS 3.8.4 Conditions D, E, and F meet the requirements for inclusion in the RICT Program.

Energy Northwest has determined that the application of a RICT for these Columbia plant-specific TS Actions is consistent with TSTF-505, Revision 2, and with the NRC's model safety evaluation dated November 21, 2018. Application of a RICT for these plant-specific TS Actions will be controlled under the proposed RICT Program. The RICT Program provides the necessary administrative controls to permit extension of CTs and thereby delay reactor shutdown or remedial actions if risk is assessed and managed within specified limits and programmatic requirements. The specified safety function or performance levels of TS required SSCs are unchanged, and the remedial actions, including the requirement to shut down the reactor, are also unchanged; only the TS Action CTs may be extended within the governance of the RICT Program.

Application of a RICT will be evaluated using the methodology and probabilistic risk guidelines contained in NEI 06-09-A, "Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines," Revision 0 which was approved by the NRC on May 17, 2007. The NEI 06-09-A, Revision 0, methodology includes a requirement to perform a quantitative assessment of the potential impact of the application of a RICT on risk, to reassess risk due to plant configuration changes, and to implement compensatory measures and RMAs to maintain the risk below acceptable regulatory risk thresholds.

Therefore, the proposed application of a RICT to the above Columbia plant-specific TS Actions is consistent with TSTF-505, Revision 2 and with the NRC staff's model safety evaluation dated November 21, 2018.

Energy Northwest has reviewed these proposed changes and determined that they do not affect the applicability of TSTF-505, Revision 2 to the Columbia TS.

3.0 REGULATORY SAFETY ANALYSIS

3.1 No Significant Hazards Consideration Analysis

Energy Northwest has evaluated the proposed change to the TS using the criteria in 10 CFR 50.92 and has determined that the proposed change does not involve a significant hazards consideration.

Columbia requests adoption of an approved change to the standard technical specifications (STS) and plant-specific technical specifications (TS), to modify the TS requirements related to Completion Times for Required Actions to provide the option to calculate a longer, risk-informed Completion Time.

The allowance is described in a new program in Chapter 5, "Administrative Controls," entitled the "Risk-Informed Completion Time Program."

As required by 10 CFR 50.91(a), an analysis of the issue of no significant hazards consideration is presented below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed change permits the extension of Completion Times provided the associated risk is assessed and managed in accordance with the NRC approved Risk-Informed Completion Time Program. The proposed change does not involve a significant increase in the probability of an accident previously evaluated because the change involves no change to the plant or its modes of operation. The proposed change does not increase the consequences of an accident because the design-basis mitigation function of the affected systems is not changed and the consequences of an accident during the extended Completion Time are no different from those during the existing Completion Time.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed changes do not change the design, configuration, or method of operation of the plant. The proposed changes do not involve a physical alteration of the plant (no new or different kind of equipment will be installed.)

   Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Do the proposed changes involve a significant reduction in a margin of safety?

   Response: No.

> The proposed changes permit the extension of Completion Times provided that risk is assessed and managed in accordance with the NRC approved Risk-Informed Completion Time Program. The proposed changes implement a risk-informed configuration management program to assure that adequate margins of safety are maintained. Application of these new specifications and the configuration management program considers cumulative effect of multiple systems or components being out of service and does so more effectively than the current TS.
>
> Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based on the above, Energy Northwest concludes that the proposed changes present no significant hazards consideration under standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

3.2 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

4.0 ENVIRONMENTAL CONSIDERATION

Energy Northwest has reviewed the environmental evaluation included in the model safety evaluation published on November 21, 2018 (ADAMS Accession Mo. ML18267A259) as part of the Notice of Availability. Energy Northwest has concluded that the NRC staff findings presented in that evaluation are applicable to Columbia.

The proposed changes would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9).

Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

5.0 REFERENCES

1. NRC letter to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines’,” dated May 17, 2007 (ADAMS Accession No. ML071200238).
2. TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b” (ADAMS Accession No. ML18183A493).
3. NRC letter to Technical Specifications Task Force, “Final Revised Model Safety Evaluation of Traveler TSTF-505, Revision 2, ‘Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b,’” dated November 21, 2018 (ADAMS Accession No. ML18253A085).
4. NRC NUREG-1433, “Standard Technical Specifications, General Electric Plants, BWR/4,” Revision 4, Volumes 1 and 2, dated April 2012.
5. NRC NUREG-1434, “Standard Technical Specifications, General Electric Plants, BWR/6,” Revision 4, Volumes 1 and 2, dated April 2012.

Attachment 2

Proposed Technical Specification Changes (Mark-Up)

(37 pages follow)

1.3 Completion Times

EXAMPLES (continued)

Required Action A.1 has two Completion Times. The 1 hour Completion Time begins at the time the Condition is entered and each "Once per 8 hours thereafter" interval begins upon performance of Required Action A.1.

See Insert 1

If after Condition A is entered, Required Action A.1 is not met within either the initial 1 hour or any subsequent 8 hour interval from the previous performance (plus the extension allowed by SR 3.0.2), Condition B is entered. The Completion Time clock for Condition A does not stop after Condition B is entered, but continues from the time Condition A was initially entered. If Required Action A.1 is met after Condition B is entered, Condition B is exited and operation may continue in accordance with Condition A, provided the Completion Time for Required Action A.2 has not expired.

IMMEDIATE COMPLETION TIME	When "Immediately" is used as a Completion Time, the Required Action should be pursued without delay and in a controlled manner.

3.1 REACTIVITY CONTROL SYSTEMS

3.1.7 Standby Liquid Control (SLC) System

LCO 3.1.7 Two SLC subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One SLC subsystem inoperable.	A.1	Restore SLC subsystem to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program
B. Two SLC subsystems inoperable.	B.1	Restore one SLC subsystem to OPERABLE status.	8 hours
C. Required Action and associated Completion Time not met.	C.1	Be in MODE 3.	12 hours
	AND		
	C.2	Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.7.1	Verify available volume of sodium pentaborate solution is ≥ 4587 gallons.	In accordance with the Surveillance Frequency Control Program

3.3 INSTRUMENTATION

3.3.1.1 Reactor Protection System (RPS) Instrumentation

LCO 3.3.1.1 The RPS instrumentation for each Function in Table 3.3.1.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1.1-1

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1 Place channel in trip.	12 hours OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
	OR	
	-------------NOTE-------------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f. ----------------------------------	
	A.2 Place associated trip system in trip.	12 hours
--------------NOTE-------------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f. ------------------------------------	B.1 Place channel in one trip system in trip.	6 hours OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
	OR	
B. One or more Functions with one or more required channels inoperable in both trip systems.	B.2 Place one trip system in trip.	6 hours

3.3 INSTRUMENTATION

3.3.2.2 Feedwater and Main Turbine High Water Level Trip Instrumentation

LCO 3.3.2.2 Three channels of feedwater and main turbine high water level trip instrumentation shall be OPERABLE.

APPLICABILITY: THERMAL POWER ≥ 25% RTP.

ACTIONS

-----NOTE-----

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One feedwater and main turbine high water level trip channel inoperable.	A.1	Place channel in trip.	7 days OR In accordance with the Risk Informed Completion Time Program
B. Two or more feedwater and main turbine high water level trip channels inoperable.	B.1	Restore feedwater and main turbine high water level trip capability.	2 hours
C. Required Action and associated Completion Time not met.	C.1	Reduce THERMAL POWER to < 25% RTP.	4 hours

3.3 INSTRUMENTATION

3.3.4.1 End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation

LCO 3.3.4.1

a. Two channels per trip system for each EOC-RPT instrumentation Function listed below shall be OPERABLE:

1. Turbine Throttle Valve (TTV) – Closure; and
2. Turbine Governor Valve (TGV) Fast Closure, Trip Oil Pressure - Low.

OR

b. LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)," limits for inoperable EOC-RPT as specified in the COLR are made applicable.

APPLICABILITY: THERMAL POWER ≥ 29.5% RTP.

ACTIONS

---NOTE---

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Restore channel to OPERABLE status.	72 hours OR In accordance with the Risk Informed Completion Time Program
	OR		
	A.2	---------------NOTE--------------- Not applicable if inoperable channel is the result of an inoperable breaker. --- Place channel in trip.	72 hours OR In accordance with the Risk Informed Completion Time Program

3.3 INSTRUMENTATION

3.3.4.2 Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation

LCO 3.3.4.2 Two channels per trip system for each ATWS-RPT instrumentation Function listed below shall be OPERABLE:

- a. Reactor Vessel Water Level - Low Low, Level 2; and
- b. Reactor Vessel Steam Dome Pressure - High.

APPLICABILITY: MODE 1.

ACTIONS

---NOTE---
Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Restore channel to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program
	OR	
	A.2 ---------------NOTE-------------- Not applicable if inoperable channel is the result of an inoperable breaker. ------------------------------------- Place channel in trip.	7 days OR In accordance with the Risk Informed Completion Time Program
B. One Function with ATWS-RPT trip capability not maintained.	B.1 Restore ATWS-RPT trip capability.	72 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.2 -------------NOTE------------ Only applicable for Functions 3.a and 3.b. ------------------------------------ Declare High Pressure Core Spray (HPCS) System inoperable.	1 hour from discovery of loss of HPCS initiation capability
	AND	
	B.3 Place channel in trip.	24 hours OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
C. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	C.1 -------------NOTE------------ Only applicable for Functions 1.c, 1.d, 1.e, 1.f, 2.c, 2.d, 2.e, and 2.f. ------------------------------------ Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND	
	C.2 Restore channel to OPERABLE status.	24 hours OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	D.1	--------------NOTE------------- Only applicable if HPCS pump suction is not aligned to the suppression pool. -------------------------------------	
		Declare HPCS System inoperable.	1 hour from discovery of loss of HPCS initiation capability
	AND		
	D.2.1	Place channel in trip.	24 hours OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
	OR		
	D.2.2	Align the HPCS pump suction to the suppression pool.	24 hours
E. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	E.1	-------------NOTE------------ Only applicable for Functions 1.g, 1.h, and 2.g. -----------------------------------	
		Declare supported feature(s) inoperable when its redundant feature ECCS initiation capability is inoperable.	1 hour from discovery of loss of initiation capability for feature(s) in both divisions
	AND		
	E.2	Restore channel to OPERABLE status.	7 days OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
F. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	F.1 Declare Automatic Depressurization System (ADS) valves inoperable.	1 hour from discovery of loss of ADS initiation capabili both trip systems ------NOTE--------- The Risk Informed Completion Time Program is not applicable when a loss of function occurs. ------------------------
	AND	
	F.2 Place channel in trip. or in accordance with the Risk Informed Completion Time Program	96 hours from discovery of inoperable chann concurrent with HPCS or reactor core isolation cooling (RCIC) inoperable AND 8 days ------NOTE--------- The Risk Informed Completion Time Program is not applicable when a loss of function occurs. ------------------------
G. As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	G.1 ---------------NOTE-------------- Only applicable for Functions 4.b, 4.d, 4.e, 5.b, and 5.d. --- Declare ADS valves inoperable.	1 hour from discovery of loss of ADS initiation capability in both trip systems
------NOTE--------- The Risk Informed Completion Time Program is not applicable when a loss of function occurs. ------------------------	AND	or in accordance with the Risk Informed Completion Time Program
	G.2 Restore channel to OPERABLE status. ------NOTE--------- The Risk Informed Completion Time Program is not applicable when a loss of function occurs. ------------------------	96 hours from discovery of inoperable channel concurrent with HPCS or RCIC inoperable AND 8 days

3.3 INSTRUMENTATION

3.3.5.3 Reactor Core Isolation Cooling (RCIC) System Instrumentation

LCO 3.3.5.3 The RCIC System instrumentation for each Function in Table 3.3.5.3-1 shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > 150 psig.

ACTIONS

-----------------------------NOTE-----------------------------

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more channels inoperable.	A.1 Enter the Condition referenced in Table 3.3.5.3-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.5.3-1.	B.1 Declare RCIC System inoperable.	1 hour from discovery of loss of RCIC initiation capability
	<u>AND</u>	
	B.2 Place channel in trip.	24 hours <u>OR</u> ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
C. As required by Required Action A.1 and referenced in Table 3.3.5.3-1.	C.1 Restore channel to OPERABLE status.	24 hours

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. As required by Required Action A.1 and referenced in Table 3.3.5.3-1.	D.1 --------------NOTE------------- Only applicable if RCIC pump suction is not aligned to the suppression pool. ------------------------------------- Declare RCIC System inoperable.	1 hour from discovery of loss of RCIC initiation capability
	AND	
	D.2.1 Place channel in trip.	24 hours OR ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
	OR	
	D.2.2 Align RCIC pump suction to the suppression pool.	24 hours
E. Required Action and associated Completion Time of Condition B, C, or D not met.	E.1 Declare RCIC System inoperable.	Immediately

3.3 INSTRUMENTATION

3.3.6.1 Primary Containment Isolation Instrumentation

LCO 3.3.6.1 The primary containment isolation instrumentation for each Function in Table 3.3.6.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.6.1-1.

ACTIONS

---NOTES---

1. Penetration flow paths may be unisolated intermittently under administrative controls.

2. Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channels inoperable.	A.1 Place channel in trip.	12 hours for Functions 2.a, 2.c, 5.d, 6.a, and 6.b AND 24 hours for Functions other than Functions 2.a, 2.c, 5.d, 6.a, and 6.b
B. One or more automatic Functions with isolation capability not maintained.	B.1 Restore isolation capability.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 Enter the Condition referenced in Table 3.3.6.1-1 for the channel.	Immediately

------NOTE---------
The Risk Informed Completion Time Program is not applicable when a loss of function occurs.
----

or in accordance with the Risk Informed Completion Time Program

3.3 INSTRUMENTATION

3.3.8.1 Loss of Power (LOP) Instrumentation

LCO 3.3.8.1 The LOP instrumentation for each Function in Table 3.3.8.1-1 shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3

ACTIONS

--NOTE--

Separate Condition entry is allowed for each channel.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more required channels inoperable.	A.1	Enter the Condition referenced in Table 3.3.8.1-1 for the channel.	Immediately
B. As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	B.1	Declare associated DG inoperable.	1 hour from discovery of loss of initiation capability for the associated DG
	<u>AND</u>		
	B.2	Restore channel to OPERABLE status.	24 hours <u>OR</u> ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program
C. As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	C.1	Place channel in trip.	1 hour <u>OR</u> ------NOTE--------- Not applicable when a loss of function occurs. ------------------------ In accordance with the Risk Informed Completion Time Program

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.1 ECCS - Operating

LCO 3.5.1 Each ECCS injection/spray subsystem and the Automatic Depressurization System (ADS) function of six safety/relief valves shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3, except ADS valves are not required to be OPERABLE with reactor steam dome pressure ≤ 150 psig.

ACTIONS

--NOTE--

LCO 3.0.4.b is not applicable to High Pressure Core Spray (HPCS).

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One low pressure ECCS injection/spray subsystem inoperable.	A.1 Restore low pressure ECCS injection/spray subsystem to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program
B HPCS System inoperable.	B.1 Verify by administrative means RCIC System is OPERABLE when RCIC System is required to be OPERABLE.	Immediately
	AND	
	B.2 Restore HPCS System to OPERABLE status.	14 days OR In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two ECCS injection subsystems inoperable. <u>OR</u> One ECCS injection and one ECCS spray subsystem inoperable.	C.1 Restore ECCS injection/spray subsystem to OPERABLE status.	72 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 --------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
E. One required ADS valve inoperable.	E.1 Restore ADS valve to OPERABLE status.	14 days <u>OR</u> In accordance with the Risk Informed Completion Time Program
F. One required ADS valve inoperable. <u>AND</u> One low pressure ECCS injection/spray subsystem inoperable.	F.1 Restore ADS valve to OPERABLE status. <u>OR</u> F.2 Restore low pressure ECCS injection/spray subsystem to OPERABLE status.	72 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program 72 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS), RPV WATER INVENTORY CONTROL, AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.3 RCIC System

LCO 3.5.3 The RCIC System shall be OPERABLE.

APPLICABILITY: MODE 1,
MODES 2 and 3 with reactor steam dome pressure > 150 psig.

ACTIONS

---NOTE---

LCO 3.0.4.b is not applicable to RCIC.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCIC System inoperable.	A.1 Verify by administrative means High Pressure Core Spray System is OPERABLE.	Immediately
	<u>AND</u>	
	A.2 Restore RCIC System to OPERABLE status.	14 days <u>OR</u> In accordance with the Risk Informed Completion Time Program
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	<u>AND</u>	
	B.2 Reduce reactor steam dome pressure to ≤ 150 psig.	36 hours

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.3	---------------NOTE-------------- Air lock doors in high radiation areas or areas with limited access due to inerting may be verified locked closed by administrative means. ------------------------------------- Verify an OPERABLE door is locked closed.	Once per 31 days
C. Primary containment air lock inoperable for reasons other than Condition A or B.	C.1	Initiate action to evaluate primary containment overall leakage rate per LCO 3.6.1.1, using current air lock test results.	Immediately
	<u>AND</u>		
	C.2	Verify a door is closed.	1 hour
	<u>AND</u>		
	C.3	Restore air lock to OPERABLE status.	24 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
D. Required Action and associated Completion Time not met.	D.1	Be in MODE 3.	12 hours
	<u>AND</u>		
	D.2	Be in MODE 4.	36 hours

3.6 CONTAINMENT SYSTEMS

3.6.1.3 Primary Containment Isolation Valves (PCIVs)

LCO 3.6.1.3 Each PCIV, except reactor building-to-suppression chamber vacuum breakers, shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3

ACTIONS

---NOTES---

1. Penetration flow paths may be unisolated intermittently under administrative controls.
2. Separate Condition entry is allowed for each penetration flow path.
3. Enter applicable Conditions and Required Actions for systems made inoperable by PCIVs.
4. Enter applicable Conditions and Required Actions of LCO 3.6.1.1, "Primary Containment," when PCIV leakage results in exceeding overall containment leakage rate acceptance criteria.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ------------NOTE------------ Only applicable to penetration flow paths with two PCIVs. --------------------------------- One or more penetration flow paths with one PCIV inoperable for reasons other than Condition D.	A.1 Isolate the affected penetration flow path by use of at least one closed and de-activated automatic valve, closed manual valve, blind flange, or check valve with flow through the valve secured. AND	4 hours except for main steam line AND 8 hours for main steam line

or in accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.2	---------------NOTE-------------- 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by use of administrative means. ------------------------------------- Verify the affected penetration flow path is isolated.	Once per 31 days following isolation for isolation devices outside primary containment AND Prior to entering MODE 2 or 3 from MODE 4 if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days, for isolation devices inside primary containment

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. (continued)	C.2 --------------NOTES------------- 1. Isolation devices in high radiation areas may be verified by use of administrative means. 2. Isolation devices that are locked, sealed, or otherwise secured may be verified by use of administrative means. ------------------------------------- Verify the affected penetration flow path is isolated.	following isolation Once per 31 days for isolation devices outside primary containment <u>AND</u> Prior to entering MODE 2 or 3 from MODE 4 if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days, for isolation devices inside primary containment

3.6 CONTAINMENT SYSTEMS

3.6.1.5 Residual Heat Removal (RHR) Drywell Spray

LCO 3.6.1.5 Two RHR drywell spray subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One RHR drywell spray subsystem inoperable.	A.1	Restore RHR drywell spray subsystem to OPERABLE status.	7 days~~(1)~~ OR In accordance with the Risk Informed Completion Time Program
B. Two RHR drywell spray subsystems inoperable.	B.1	Restore one RHR drywell spray subsystem to OPERABLE status.	8 hours
C. Required Action and associated Completion Time not met.	C.1	--------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------ Be in MODE 3.	12 hours

---

~~(1) The Completion Time that one train of RHR (RHR-A) can be inoperable as specified by Required Action A.1 may be extended beyond the 7 day completion time up to 7 days to support restoration of RHR-A following pump and motor replacement. This footnote will expire at 23:59 PST February 28, 2019.~~

3.6 CONTAINMENT SYSTEMS

3.6.1.6 Reactor Building-to-Suppression Chamber Vacuum Breakers

LCO 3.6.1.6 Each reactor building-to-suppression chamber vacuum breaker shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

-----------------------------------NOTE-----------------------------------
Separate Condition entry is allowed for each line.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more lines with one reactor building-to-suppression chamber vacuum breaker not closed.	A.1 Close the open vacuum breaker.	72 hours
B. One or more lines with two reactor building-to-suppression chamber vacuum breakers not closed.	B.1 Close one open vacuum breaker.	1 hour
C. One line with one or more reactor building-to-suppression chamber vacuum breakers inoperable for opening.	C.1 Restore the vacuum breaker(s) to OPERABLE status.	72 hours OR In accordance with the Risk Informed Completion Time Program
D. Required Action and associated Completion Time of Condition C not met.	D.1 ------------NOTE------------ LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------- Be in MODE 3.	12 hours.

3.6 CONTAINMENT SYSTEMS

3.6.1.7 Suppression Chamber-to-Drywell Vacuum Breakers

LCO 3.6.1.7 Seven suppression chamber-to-drywell vacuum breakers shall be OPERABLE for opening.

<u>AND</u>

Nine suppression chamber-to-drywell vacuum breakers shall be closed, except when performing their intended function.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required suppression chamber-to-drywell vacuum breaker inoperable for opening.	A.1 Restore one vacuum breaker to OPERABLE status.	72 hours OR In accordance with the Risk Informed Completion Time Program
B. Required Action and associated Completion Time of Condition A not met.	B.1 --------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------ Be in MODE 3.	12 hours
C. ------------NOTE------------ Separate Condition entry is allowed for each suppression chamber-to-drywell vacuum breaker. -------------------------------- One or more suppression chamber-to-drywell vacuum breakers with one disk not closed.	C.1 Close the open vacuum breaker disk.	72 hours

3.6 CONTAINMENT SYSTEMS

3.6.2.3 Residual Heat Removal (RHR) Suppression Pool Cooling

LCO 3.6.2.3 Two RHR suppression pool cooling subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RHR suppression pool cooling subsystem inoperable.	A.1 Restore RHR suppression pool cooling subsystem to OPERABLE status.	7 days~~(1)~~ OR In accordance with the Risk Informed Completion Time Program
B. Required Action and associated Completion Time of Condition A not met.	B.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. ------------------------------------- Be in MODE 3.	12 hours
C. Two RHR suppression pool cooling subsystems inoperable.	C.1 Be in MODE 3.	12 hours
	AND	
	C.2 Be in MODE 4.	36 hours

~~(1) The Completion Time that one train of RHR (RHR-A) can be inoperable as specified by Required Action A.1 may be extended beyond the 7 day completion time up to 7 days to support restoration of RHR-A following pump and motor replacement. This footnote will expire at 23:59 PST February 28, 2019.~~

3.7 PLANT SYSTEMS

3.7.1 Standby Service Water (SW) System and Ultimate Heat Sink (UHS)

LCO 3.7.1 Division 1 and 2 SW subsystems and UHS shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Average sediment depth in one or both spray ponds ≥ 0.5 ft and < 1.0 ft.	A.1	Restore average sediment depth to within limits.	30 days
B. One SW subsystem inoperable.	B.1	--------------NOTES------------ 1. Enter applicable Conditions and Required Actions of LCO 3.8.1, "AC Sources - Operating," for diesel generator made inoperable by SW System. 2. Enter applicable Conditions and Required Actions of LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown," for RHR shutdown cooling subsystem made inoperable by SW System. ------------------------------------- Restore SW subsystem to OPERABLE status.	72 hours OR In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.2	Declare required feature(s) with no offsite power available inoperable when the redundant required feature(s) are inoperable.	24 hours from discovery of no offsite power to one division concurrent with inoperability of redundant required feature(s)
	<u>AND</u>		
	A.3	Restore offsite circuit to OPERABLE status.	72 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
B. One required DG inoperable.	B.1	Perform SR 3.8.1.1 for OPERABLE offsite circuit(s).	1 hour <u>AND</u> Once per 8 hours thereafter
	<u>AND</u>		
	B.2	Declare required feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable.	4 hours from discovery of Condition B concurrent with inoperability of redundant required feature(s)
	<u>AND</u>		

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3.1 Determine OPERABLE DG(s) are not inoperable due to common cause failure.	24 hours
	OR	
	B.3.2 Perform SR 3.8.1.2 for OPERABLE DG(s).	24 hours if not performed within the past 24 hours
	AND	
	B.4.1 Restore required DG to OPERABLE status.	72 hours from discovery of an inoperable DG
OR In accordance with the Risk Informed Completion Time Program		
	OR	
	B.4.2.1 Establish risk management actions for the alternate AC sources.	72 hours
	AND	
	B.4.2.2 Restore required DG to OPERABLE status.	14 days

OR
In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. Two offsite circuits inoperable.	C.1	Declare required feature(s) inoperable when the redundant required feature(s) are inoperable.	12 hours from discovery of Condition C concurrent with inoperability of redundant required feature(s)
	AND		
	C.2	Restore one offsite circuit to OPERABLE status.	24 hours OR In accordance with the Risk Informed Completion Time Program
D. One offsite circuit inoperable. AND One required DG inoperable.	--------------------NOTE-------------------- Enter applicable Conditions and Required Actions of LCO 3.8.7, "Distribution Systems - Operating," when Condition D is entered with no AC power source to any division. ---		
	D.1	Restore offsite circuit to OPERABLE status.	12 hours OR In accordance with the Risk Informed Completion Time Program
	OR		
	D.2	Restore required DG to OPERABLE status.	12 hours OR In accordance with the Risk Informed Completion Time Program
E. Two required DGs inoperable.	E.1	Restore one required DG to OPERABLE status.	2 hours OR 24 hours if Division 3 DG is inoperable

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources - Operating

LCO 3.8.4 The Division 1, Division 2, and Division 3 DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required Division 1 or 2 125 V DC battery charger inoperable.	A.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND		
	A.2	Verify battery float current ≤ 2 amps.	Once per 12 hours
	AND		
	A.3	Restore required battery charger to OPERABLE status.	72 hours OR In accordance with the Risk Informed Completion Time Program
B. One required Division 3 125 V DC battery charger inoperable.	B.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	AND		
	B.2	Verify battery float current ≤ 2 amps.	Once per 12 hours
	AND		
	B.3	Restore required battery charger to OPERABLE status.	72 hours OR In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. One required Division 1 250 V DC battery charger inoperable.	C.1	Restore battery terminal voltage to greater than or equal to the minimum established float voltage.	2 hours
	<u>AND</u>		
	C.2	Verify battery float current ≤ 2 amps.	Once per 12 hours
	<u>AND</u>		
	C.3	Restore required battery charger to OPERABLE status.	72 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
D. One required Division 1 or 2 125 V DC battery inoperable.	D.1	Restore battery to OPERABLE status.	2 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
E. One required Division 3 125 V DC battery inoperable.	E.1	Restore battery to OPERABLE status.	2 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
F. One required Division 1 250 V DC battery inoperable.	F.1	Restore battery to OPERABLE status.	2 hours <u>OR</u> In accordance with the Risk Informed Completion Time Program
G. Division 1 or 2 125 V DC electrical power subsystem inoperable for reasons other than Condition A or D.	G.1	Restore Division 1 and 2 125 V DC electrical power subsystems to OPERABLE status.	~~------------NOTE----------~~ ~~Until June 30, 2021, a Completion Time of 16 hours is applicable for replacement of WMA-42-8F1E or its failed starter coil.~~ ~~-----------------------------~~ 2 Hours <u>OR</u> In accordance with the Risk Informed Completion Time Program

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Division 1 or 2 AC electrical power distribution subsystem inoperable.	A.1 Restore Division 1 and 2 AC electrical power distribution subsystems to OPERABLE status.	8 hours OR In accordance with the Risk Informed Completion Time Program
B. Division 1 or 2 125 V DC electrical power distribution subsystem inoperable.	B.1 Restore Division 1 and 2 125 V DC electrical power distribution subsystems to OPERABLE status.	2 hours OR In accordance with the Risk Informed Completion Time Program
C. Required Action and associated Completion Time of Condition A or B not met.	C.1 ---------------NOTE-------------- LCO 3.0.4.a is not applicable when entering MODE 3. Be in MODE 3.	12 hours
D. Division 1 250 V DC electrical power distribution subsystem inoperable.	D.1 Declare associated supported feature(s) inoperable.	Immediately
E. One or more Division 3 AC or DC electrical power distribution subsystems inoperable.	E.1 Declare High Pressure Core Spray System inoperable.	Immediately
F. Two or more divisions with inoperable electrical power distribution subsystems that result in a loss of function.	F.1 Enter LCO 3.0.3.	Immediately

5.5 Programs and Manuals

5.5.15 Surveillance Frequency Control Program

This program provides controls for Surveillance Frequencies. The program shall ensure that Surveillance Requirements specified in the Technical Specifications are performed at intervals sufficient to assure the associated Limiting Conditions for Operation are met.

a. The Surveillance Frequency Control Program shall contain a list of Frequencies of those Surveillance Requirements for which the Frequency is controlled by the program.

b. Changes to the Frequencies listed in the Surveillance Frequency Control Program shall be made in accordance with NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies," Revision 1.

c. The provisions of Surveillance Requirements 3.0.2 and 3.0.3 are applicable to the Frequencies established in the Surveillance Frequency Control Program.

Insert 2

Insert 1

EXAMPLES (continued)

EXAMPLE 1.3-8

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One subsystem inoperable.	A.1 Restore subsystem to OPERABLE status.	7 days OR In accordance with the Risk Informed Completion Time Program
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	12 hours
	AND	
	B.2 Be in MODE 4.	36 hours

When a subsystem is declared inoperable, Condition A is entered. The 7 day Completion Time may be applied as discussed in Example 1.3-2. However, the licensee may elect to apply the Risk Informed Completion Time Program which permits calculation of a Risk Informed Completion Time (RICT) that may be used to complete the Required Action beyond the 7 day Completion Time. The RICT cannot exceed 30 days. After the 7 day Completion Time has expired, the subsystem must be restored to OPERABLE status within the RICT or Condition B must also be entered.

The Risk Informed Completion Time Program requires recalculation of the RICT to reflect changing plant conditions. For planned changes, the revised RICT must be determined prior to implementation of the change in configuration. For emergent conditions, the revised RICT must be determined within the time limits of the Required Action Completion Time (i.e., not the RICT) or 12 hours after the plant configuration change, whichever is less.

If the 7 day Completion Time clock of Condition A has expired and subsequent changes in plant condition result in exiting the applicability of the Risk Informed Completion Time Program without restoring the inoperable subsystem to OPERABLE status, Condition B is also entered and the Completion Time clocks for Required Actions B.1 and B.2 start.

If the RICT expires or is recalculated to be less than the elapsed time since the Condition was entered and the inoperable subsystem has not been restored to OPERABLE status, Condition B is also entered and the Completion Time clocks for Required Actions B.1 and B.2 start. If the inoperable subsystems are restored to OPERABLE status after Condition B is entered, Condition A is exited, and therefore, the Required Actions of Condition B may be terminated.

Insert 2

5.5.16 Risk Informed Completion Time Program

This program provides controls to calculate a Risk Informed Completion Time (RICT) and must be implemented in accordance with NEI 06-09-A, Revision 0, "Risk-Managed Technical Specifications (RMTS) Guidelines." The program shall include the following:

a. The RICT may not exceed 30 days;

b. A RICT may only be utilized in MODES 1 and 2;

c. When a RICT is being used, any change to the plant configuration, as defined in NEI 06-09-A, Appendix A, must be considered for the effect on the RICT.

   1. For planned changes, the revised RICT must be determined prior to implementation of the change in configuration.

   2. For emergent conditions, the revised RICT must be determined within the time limits of the Required Action Completion Time (i.e., not the RICT) or 12 hours after the plant configuration change, whichever is less.

   3. Revising the RICT is not required if the plant configuration change would lower plant risk and would result in a longer RICT.

d. For emergent conditions, if the extent of condition evaluation for inoperable structures, systems, or components (SSCs) is not complete prior to exceeding the Completion Time, the RICT shall account for the increased possibility of common cause failure (CCF) by either:

   1. Numerically accounting for the increased possibility of CCF in the RICT calculation; or

   2. Risk Management Actions (RMAs) not already credited in the RICT calculation shall be implemented that support redundant or diverse SSCs that perform the function(s) of the inoperable SSCs, and, if practicable, reduce the frequency of initiating events that challenge the functions(s) performed by the inoperable SSCs.

e. The risk assessment approaches and methods shall be acceptable to the NRC. The plant PRA shall be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant, as specified in Regulatory Guide 1.200, Revision 2. Methods to assess the risk from extending the Completion Times must be PRA methods used to support this program in Amendment No. [###], or other methods approved by the NRC for generic use; and any change in the PRA methods to assess risk that are outside these approval boundaries require prior NRC approval.

Attachment 3

Proposed Technical Specifications Bases Pages Changes (Markup) For Information Only

(37 pages follow)

APPLICABLE SAFETY ANALYSES (continued)

Following a LOCA, offsite doses from the accident will remain within 10 CFR 50.67, "Accident Source Term," limits (Ref. 5) provided sufficient iodine activity is retained in the suppression pool. Credit for iodine deposition in the suppression pool is allowed (Ref. 4) as long as suppression pool pH is maintained at or above 7. Alternative Source Term analyses credit the use of the SLC System for maintaining the pH of the suppression pool at or above 7.

The SLC System satisfies Criteria 3 and 4 of Reference 3.

LCO

The OPERABILITY of the SLC System provides backup capability for reactivity control, independent of normal reactivity control provisions provided by the control rods. Additionally, an OPERABLE SLC System has the ability to inject boron under post LOCA conditions to maintain the suppression pool pH above 7. The OPERABILITY of the SLC System is based on the conditions of the borated solution in the storage tank and the availability of a flow path to the RPV, including the OPERABILITY of the pumps and valves. Two SLC subsystems are required to be OPERABLE, each containing an OPERABLE pump, an explosive valve and associated piping, valves, and instruments and controls to ensure an OPERABLE flow path.

APPLICABILITY

In MODES 1 and 2, shutdown capability is required. In MODES 3 and 4, control rods are not able to be withdrawn since the reactor mode switch is in shutdown and a control rod block is applied. This provides adequate controls to ensure the reactor remains subcritical. In MODE 5, only a single control rod can be withdrawn from a core cell containing fuel assemblies. Demonstration of adequate SDM (LCO 3.1.1, "SHUTDOWN MARGIN (SDM)") ensures that the reactor will not become critical. Therefore, the SLC System is not required to perform its ATWS function during MODES 3, 4, or 5.

In MODES 1, 2, and 3, the SLC System must be OPERABLE to ensure that offsite doses remain within 10 CFR 50.67 (Ref. 5) limits following a LOCA involving significant fission product releases. The SLC System is used to maintain suppression pool pH at or above 7 following a LOCA to ensure that iodine will be retained in the suppression pool water (Ref. 4).

ACTIONS

A.1

or in accordance with the Risk Informed Completion Program

If one SLC System subsystem is inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE subsystem is adequate to perform the original licensing basis shutdown function. However, the overall reliability is reduced because a single failure in the remaining OPERABLE subsystem

BASES

ACTIONS (continued)

service time is only acceptable provided the associated Functions inoperable channel is in one trip system and the Function still maintains RPS trip capability (refer to Required Actions B.1, B.2, and C.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel or the associated trip system must be placed in the tripped condition per Required Actions A.1 and A.2. Placing the inoperable channel in trip (or the associated trip system in trip) would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel (or trip system) in trip (e.g., as in the case where placing the inoperable channel in trip would result in a full scram), Condition D must be entered and its Required Action taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function as defined in TS 5.11.b.

As noted, Action A.2 is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. Inoperability of one required APRM channel affects both trip systems. For that condition, Required Action A.1 must be satisfied, and is the only action (other than restoring OPERABILITY) that will restore capability to accommodate a single failure. Inoperability of more than one required APRM channel of the same trip function results in loss of trip capability and entry into Condition C, as well as entry into Condition A for each channel.

B.1 and B.2

Condition B exists when, for any one or more Functions, at least one required channel is inoperable in each trip system. In this condition, provided at least one channel per trip system is OPERABLE, the RPS still maintains trip capability for that Function, but cannot accommodate a single failure in either trip system.

Required Actions B.1 and B.2 limit the time the RPS scram logic for any Function would not accommodate single failure in both trip systems (e.g., one-out-of-one and one-out-of-one arrangement for a typical four channel Function). The reduced reliability of this logic arrangement was not evaluated in Reference 11 for the 12 hour Completion Time. Within the 6 hour allowance, the associated Function will have all required channels either OPERABLE or in trip (or in any combination) in one trip system.

Completing one of these Required Actions restores RPS to an equivalent reliability level as that evaluated in References 11 and 14, which justified a 12 hour allowable out of service time as presented in Condition A. The trip system in the more degraded state should be placed in trip or, alternatively, all the inoperable channels in that trip system should be placed in trip (e.g., a trip system with two inoperable channels could be in

BASES

ACTIONS (continued)

a more degraded state than a trip system with four inoperable channels, if the two inoperable channels are in the same Function while the four inoperable channels are all in different Functions). The decision as to which trip system is in the more degraded state should be based on prudent judgment and current plant conditions (i.e., what MODE the plant is in). If this action would result in a scram or recirculation pump trip, it is permissible to place the other trip system or its inoperable channels in trip.

The 6 hour Completion Time is judged acceptable based on the remaining capability to trip, the diversity of the sensors available to provide the trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of a scram.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function as defined in TS 5.11.b.

Alternately, if it is not desired to place the inoperable channels (or one trip system) in trip (e.g., as in the case where placing the inoperable channel or associated trip system in trip would result in a scram or RPT), Condition D must be entered and its Required Action taken.

As noted, Condition B is not applicable for APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f. Inoperability of an APRM channel affects both trip systems and is not associated with a specific trip system as are the APRM 2-Out-of-4 Voter and other non-APRM channels for which Condition B applies. For an inoperable APRM channel, Required Action A.1 must be satisfied, and is the only action (other than restoring OPERABILITY) that will restore capability to accommodate a single failure. Inoperability of a Function in more than one required APRM channel results in loss of trip capability for that Function and entry into Condition C, as well as entry into Condition A for each channel. Because Conditions A and C provide Required Actions that are appropriate for the inoperability of APRM Functions 2.a, 2.b, 2.c, 2.d, or 2.f, and these functions are not associated with specific trip systems as are the APRM 2-Out-of-4 Voter and other non-APRM channels, Condition B does not apply.

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same trip system for the same Function result in the Function not maintaining RPS trip capability. A Function is considered to be maintaining RPS trip capability when sufficient channels are OPERABLE or in trip (or the associated trip system is in trip), such that both trip systems will generate a trip signal from the given Function on a valid signal. For the typical Function with one-out-of-two taken twice logic and the IRM and APRM Functions, this would require both trip systems to have one channel

BASES

ACTIONS (continued)

the Condition. However, the Required Actions for inoperable feedwater and main turbine high water level trip instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable feedwater and main turbine high water level trip instrumentation channel.

A.1

With one channel inoperable, the remaining two OPERABLE channels can provide the required trip signal. However, overall instrumentation reliability is reduced because a single failure in one of the remaining channels concurrent with feedwater controller failure, maximum demand event, may result in the instrumentation not being able to perform its intended function. Therefore, continued operation is only allowed for a limited time with one channel inoperable. If the inoperable channel cannot be restored to OPERABLE status within the Completion Time, the channel must be placed in the tripped condition per Required Action A.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue with no further restrictions. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in a feedwater or main turbine trip), Condition C must be entered and its Required Action taken.

The Completion Time of 7 days is based on the low probability of the event occurring coincident with a single failure in a remaining OPERABLE channel.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Program.

B.1

With two or more channels inoperable, the feedwater and main turbine high water level trip instrumentation cannot perform its design function (feedwater and main turbine high water level trip capability is not maintained). Therefore, continued operation is only permitted for a 2 hour period, during which feedwater and main turbine high water level trip capability must be restored. The trip capability is considered maintained when sufficient channels are OPERABLE or in trip such that the feedwater and main turbine high water level trip logic will generate a trip signal on a valid signal. This requires two channels to each be OPERABLE or in trip. If the required channels cannot be restored to OPERABLE status or placed in trip, Condition C must be entered and its Required Action taken.

ACTIONS (continued)

Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable EOC-RPT instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable EOC-RPT instrumentation channel.

A.1 and A.2

With one or more channels inoperable, but with EOC-RPT trip capability maintained (refer to Required Action B.1 and B.2 Bases), the EOC-RPT System is capable of performing the intended function. However, the reliability and redundancy of the EOC-RPT instrumentation is reduced such that a single failure in the remaining trip system could result in the inability of the EOC-RPT System to perform the intended function. Therefore, only a limited time is allowed to restore compliance with the LCO. Because of the diversity of sensors available to provide trip signals, the low probability of extensive numbers of inoperabilities affecting all diverse Functions, and the low probability of an event requiring the initiation of an EOC-RPT, 72 hours is allowed to restore the inoperable channels (Required Action A.1) or apply the EOC-RPT inoperable MCPR limit. Alternately, the inoperable channels may be placed in trip (Required Action A.2) since this would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. As noted in Required Action A.2, placing the channel in trip with no further restrictions is not allowed if the inoperable channel is the result of an inoperable breaker, since this may not adequately compensate for the inoperable breaker (e.g., the breaker may be inoperable such that it will not open). If it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an RPT), or if the inoperable channel is the result of an inoperable breaker, Condition C must be entered and its Required Actions taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

B.1 and B.2

Required Actions B.1 and B.2 are intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in the Function not maintaining EOC-RPT trip capability. A Function is considered to be maintaining EOC-RPT trip capability when sufficient channels are OPERABLE or in trip, such that the EOC-RPT System will generate a trip signal from the given Function

BASES

ACTIONS (continued)

inoperable breaker, since this may not adequately compensate for the inoperable breaker (e.g., the breaker may be inoperable such that it will not open). If it is not desirable to place the channel in trip (e.g., as in the case where placing the inoperable channel would result in an RPT), or if the inoperable channel is the result of an inoperable breaker, Condition D must be entered and its Required Actions taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in the Function not maintaining ATWS-RPT trip capability. A Function is considered to be maintaining ATWS-RPT trip capability when sufficient channels are OPERABLE or in trip such that the ATWS-RPT System will generate a trip signal from the given Function on a valid signal, and one recirculation pump can be tripped. This requires two channels of the Function in the same trip system to each be OPERABLE or in trip, and the associated drive motor breaker to be OPERABLE or in trip.

The 72 hour Completion Time is sufficient for the operator to take corrective action (e.g., restoration or tripping of channels) and takes into account the likelihood of an event requiring actuation of the ATWS-RPT instrumentation during this period and the fact that one Function is still maintaining ATWS-RPT trip capability.

C.1

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within both Functions result in both Functions not maintaining ATWS-RPT trip capability. The description of a Function maintaining ATWS-RPT trip capability is discussed in the Bases for Required Action B.1, above.

The 1 hour Completion Time is sufficient for the operator to take corrective action and takes into account the likelihood of an event requiring actuation of the ATWS-RPT instrumentation during this period.

ACTIONS (continued)

For Required Action B.1, the Completion Time only begins upon discovery that a redundant feature in both Divisions (e.g., any Division 1 ECCS and Division 2 ECCS) cannot be automatically initiated due to inoperable, untripped channels within the same variable as described in the paragraph above. For Required Action B.2, the Completion Time only begins upon discovery that the HPCS System cannot be automatically initiated due to two inoperable, untripped channels for the associated Function in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.3. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition H must be entered and its Required Action taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function as defined in TS 5.11.b.

C.1 and C.2

Required Action C.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same variable result in redundant automatic initiation capability being lost for the feature(s). Required Action C.1 features would be those that are initiated by Functions 1.c, 1.d, 1.e, 1.f, 2.c, 2.d, 2.e, and 2.f (i.e., low pressure ECCS). For Functions 1.c, 1.d, 2.c, and 2.d, redundant automatic initiation capability is lost if the Function 1.c or 1.d channel concurrent with the Function 2.c or 2.d channel are inoperable. For Functions 1.e and 2.e, redundant automatic initiation capability is lost if the Function 1.e and Function 2.e channels are inoperable. For Functions 1.f and 2.f, redundant automatic initiation capability is lost if one Function 1.f channel and one Function 2.f channel are inoperable. Since each inoperable channel would have Required Action C.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected portion of the associated Division to be declared inoperable. However, since channels in both Divisions are inoperable, and the Completion Times started concurrently for the channels in both Divisions, this results

BASES

ACTIONS (continued)

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. he Required Actions do not allow placing the channel in trip since this ction would either cause the initiation or would not necessarily result in a afe state for the channel in all events.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

1, D.2.1, and D.2.2

equired Action D.1 is intended to ensure that appropriate actions are ken if multiple, inoperable, untripped channels within the same Function sult in a complete loss of automatic component initiation capability for e HPCS System. Automatic component initiation capability is lost if two unction 3.d channels or two Function 3.e channels are inoperable and ntripped. In this situation (loss of automatic suction swap), the 24 hour lowance of Required Actions D.2.1 and D.2.2 is not appropriate and the HPCS System must be declared inoperable within 1 hour after discovery loss of HPCS initiation capability. As noted, the Required Action is only plicable if the HPCS pump suction is not aligned to the suppression ol, since, if aligned, the Function is already performed.

e Completion Time is intended to allow the operator time to evaluate d repair any discovered inoperabilities. This Completion Time also ows for an exception to the normal "time zero" for beginning the allowed tage time "clock." For Required Action D.1, the Completion Time only gins upon discovery that the HPCS System cannot be automatically gned to the suppression pool due to two inoperable, untripped channels the same Function. The 1 hour Completion Time from discovery of loss initiation capability is acceptable because it minimizes risk while owing time for restoration or tripping of channels.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

ecause of the diversity of sensors available to provide initiation signals d the redundancy of the ECCS design, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1 or the suction source must be aligned to the

ACTIONS (continued)

within 24 hours

suppression pool per Required Action D.2.2. Placing the inoperable channel in trip performs the intended function of the channel (shifting the suction source to the suppression pool). Performance of either of these two Required Actions will allow operation to continue. If Required Action D.2.1 or Required Action D.2.2 is performed, measures should be taken to ensure that the HPCS System piping remains filled with water. Alternately, if it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the HPCS suction piping), Condition H must be entered and its Required Action taken.

E.1 and E.2

Required Action E.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the LPCS and LPCI Pump Discharge Flow - Low (Minimum Flow) Functions result in redundant automatic initiation capability being lost for the feature(s). For Required Action E.1, the features would be those that are initiated by Functions 1.g, 1.h, and 2.g (e.g., low pressure ECCS). Redundant automatic initiation capability is lost if three of the four channels associated with Functions 1.g, 1.h, and 2.g are inoperable. Since each inoperable channel would have Required Action E.1 applied separately (refer to ACTIONS Note), each inoperable channel would only require the affected low pressure ECCS pump to be declared inoperable. However, since channels for more than one low pressure ECCS pump are inoperable, and the Completion Times started concurrently for the channels of the low pressure ECCS pumps, this results in the affected low pressure ECCS pumps being concurrently declared inoperable.

In this situation (loss of redundant automatic initiation capability), the 7 day allowance of Required Action E.2 is not appropriate and the feature(s) associated with each inoperable channel must be declared inoperable within 1 hour after discovery of loss of initiation capability for feature(s) in both Divisions. A Note is provided (the Note to Required Action E.1) to delineate that Required Action E.1 is only applicable to low pressure ECCS Functions. Required Action E.1 is not applicable to HPCS Function 3.f since the loss of one channel results in a loss of the Function (one-out-of-one logic). This loss was considered during the development of Reference 5 and considered acceptable for the 7 days allowed by Required Action E.2.

ACTIONS (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the lowed outage time "clock." For Required Action E.1, the Completion ime only begins upon discovery that three channels of the variable Pump Discharge Flow - Low) cannot be automatically initiated due to operable channels. The 1 hour Completion Time from discovery of loss f initiation capability is acceptable because it minimizes risk while lowing time for restoration of channels.

the instrumentation that controls the pump minimum flow valve is operable such that the valve will not automatically open, extended pump peration with no injection path available could lead to pump overheating nd failure. If there were a failure of the instrumentation such that the alve would not automatically close, a portion of the pump flow could be verted from the reactor injection path, causing insufficient core cooling. hese consequences can be averted by the operator's manual control of e valve, which would be adequate to maintain ECCS pump protection nd required flow. Furthermore, other ECCS pumps would be sufficient to complete the assumed safety function if no additional single failure were to occur. The 7 day Completion Time of Required Action E.2 to restore the inoperable channel to OPERABLE status is reasonable based on the remaining capability of the associated ECCS subsystems, the redundancy available in the ECCS design, and the low probability of a DBA occurring during the allowed out of service time. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would not necessarily result in a safe state for the channel in all events.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

F.1 and F.2

Required Action F.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within similar ADS trip system Functions result in automatic initiation capability being lost for the ADS. Automatic initiation capability is lost if either (a) one or more Function 4.a channel and one or more Function 5.a channel are inoperable and untripped, (b) one Function 4.c channel and one Function 5.c channel are inoperable and untripped, or (c) two or more Function 4.f channels and two or more Function 5.e channels are inoperable and untripped.

ACTIONS (continued)

In this situation (loss of automatic initiation capability), the 96 hour or 8 day allowance, as applicable, of Required Action F.2 is not appropriate, and all ADS valves must be declared inoperable within 1 hour after discovery of loss of ADS initiation capability in both trip systems.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action F.1, the Completion Time only begins upon discovery that the ADS cannot be automatically initiated due to inoperable, untripped channels within similar ADS trip system Functions as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 8 days has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status if both HPCS and RCIC are OPERABLE. If either HPCS or RCIC is inoperable, the time is shortened to 96 hours. If the status of HPCS or RCIC changes such that the Completion Time changes from 8 days to 96 hours, the 96 hours begins upon discovery of HPCS or RCIC inoperability. However, total time for an inoperable, untripped channel cannot exceed 8 days. If the status of HPCS or RCIC changes such that the Completion Time changes from 96 hours to 8 days, the "time zero" for beginning the 8 day "clock" begins upon discovery of the inoperable, untripped channel. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action F.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an initiation), Condition H must be entered and its Required Action taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

G.1 and G.2

Required Action G.1 is intended to ensure that appropriate actions are taken if multiple, inoperable channels within similar ADS trip system Functions result in automatic initiation capability being lost for the ADS. Automatic initiation capability is lost if either (a) one Function 4.b

ACTIONS (continued)

channel and one Function 5.b channel are inoperable, (b) one or more Function 4.d channels and one or more Function 5.d channels are inoperable, or (c) one or more Function 4.e channels and one or more Function 5.d channels are inoperable.

In this situation (loss of automatic initiation capability), the 96 hour or 8 day allowance, as applicable, of Required Action G.2 is not appropriate, and all ADS valves must be declared inoperable within 1 hour after discovery of loss of ADS initiation capability in both trip systems. The Note to Required Action G.1 states that Required Action G.1 is only applicable for Functions 4.b, 4.d, 4.e, 5.b, and 5.d. Required Action G.1 is not applicable to Functions 4.g and 5.f (which also require entry into this Condition if a channel in these Functions is inoperable), since they are the Manual Initiation Functions and are not assumed in any accident or transient analysis. Thus, a total loss of manual initiation capability for 96 hours or 8 days (as allowed by Required Action G.2) is allowed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action G.1, the Completion Time only begins upon discovery that the ADS cannot be automatically initiated due to inoperable channels within similar ADS trip system Functions, as described in the paragraph above. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

Because of the diversity of sensors available to provide initiation signals and the redundancy of the ECCS design, an allowable out of service time of 8 days has been shown to be acceptable (Ref. 5) to permit restoration of any inoperable channel to OPERABLE status if both HPCS and RCIC are OPERABLE (Required Action G.2). If either HPCS or RCIC is inoperable, the time is reduced to 96 hours. If the status of HPCS or RCIC changes such that the Completion Time changes from 8 days to 96 hours, the 96 hours begins upon discovery of HPCS or RCIC inoperability. However, total time for an inoperable channel cannot exceed 8 days. If the status of HPCS or RCIC changes such that the Completion Time changes from 96 hours to 8 days, the "time zero" for beginning the 8 day "clock" begins upon discovery of the inoperable channel. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition H must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would not necessarily result in a safe state for the channel in all events.

BASES

ACTIONS (continued)

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock."

For Required Action B.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically initiated due to two inoperable, untripped Reactor Vessel Water Level - Low Low, Level 2 channels in the same trip system. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action B.2. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an nitiation), Condition E must be entered and its Required Action taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

C.1

A risk based analysis was performed and determined that an allowable out of service time of 24 hours (Ref. 2) is acceptable to permit restoration of any inoperable channel to OPERABLE status (Required Action C.1). A Required Action (similar to Required Action B.1), limiting the allowable out of service time if a loss of automatic RCIC initiation capability exists, is not required. This Condition applies to the Reactor Vessel Water Level - High, Level 8 Function, whose logic is arranged such that any inoperable channel will result in a loss of automatic RCIC initiation capability (loss of high water level trip capability). As stated above, this loss of automatic RCIC initiation capability was analyzed and determined to be acceptable. This Condition also applies to the Manual Initiation Function. Since this Function is not assumed in any accident or transient analysis, a total loss of manual initiation capability (Required Action C.1) for 24 hours is allowed. The Required Action does not allow placing a channel in trip since this action would not necessarily result in the safe state for the channel in all events.

BASES

ACTIONS (continued)

D.1, D.2.1, and D.2.2

Required Action D.1 is intended to ensure that appropriate actions are taken if multiple inoperable, untripped channels within the same Function result in automatic component initiation capability being lost for the feature(s). For Required Action D.1, the RCIC System is the only associated feature. In this case, automatic component initiation capability is lost if two Function 3 channels are inoperable and untripped. In this situation (loss of automatic suction swap), the 24 hour allowance of Required Actions D.2.1 and D.2.2 is not appropriate, and the RCIC System must be declared inoperable within 1 hour from discovery of loss of RCIC initiation capability. As noted, Required Action D.1 is only applicable if the RCIC pump suction is not aligned to the suppression pool since, if aligned, the Function is already performed.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." For Required Action D.1, the Completion Time only begins upon discovery that the RCIC System cannot be automatically aligned to the suppression pool due to two inoperable, untripped channels in the same Function. The 1 hour Completion Time from discovery of loss of initiation capability is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

Because of the redundancy of sensors available to provide initiation signals and the fact that the RCIC System is not assumed in any accident or transient analysis, an allowable out of service time of 24 hours has been shown to be acceptable (Ref. 2) to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action D.2.1, which performs the intended function of the channel (shifting the suction source to the suppression pool). Alternatively, Required Action D.2.2 allows the manual alignment of the RCIC suction to the suppression pool, which also performs the intended function. If Required Action D.2.1 or D.2.2 is performed, measures should be taken to ensure that the RCIC System piping remains filled with water. If it is not desired to perform Required Actions D.2.1 and D.2.2 (e.g., as in the case where shifting the suction source could drain down the RCIC suction piping), Condition E must be entered and its Required Action taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

within 24 hours

BASES

ACTIONS (continued)

containment isolation instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable primary containment isolation instrumentation channel.

A.1

Because of the diversity of sensors available to provide isolation signals and the redundancy of the isolation design, an allowable out of service time of 12 hours or 24 hours, depending on the Function (12 hours for those Functions that have channel components common to RPS instrumentation and 24 hours for those Functions that do not have channel components common to RPS instrumentation), has been shown to be acceptable (Refs. 10 and 11) to permit restoration of any inoperable channel to OPERABLE status. This out of service time is only acceptable provided the associated Function is still maintaining isolation capability (refer to Required Action B.1 Bases). If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action A.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue with no further restrictions. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the inoperable channel in trip would result in an isolation), Condition C must be entered and its Required Action taken.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

B.1

Required Action B.1 is intended to ensure that appropriate actions are taken if multiple, inoperable, untripped channels within the same Function result in redundant automatic isolation capability being lost for the associated penetration flow path(s). The MSIV portions of the MSL isolation Functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip such that both trip systems will generate a trip signal from the given Function on a valid signal. The other isolation Functions and the MSL drain valves portion of the MSL isolation Functions are considered to be maintaining isolation capability when sufficient channels are OPERABLE or in trip such that one trip system will generate a trip signal from the given Function on a valid signal. This ensures that one of the two PCIVs in the associated penetration flow path can receive an isolation signal from the given Function. For Functions 1.a, 1.b, 1.d, 1.e, and 1.f, this would require

BASES

ACTIONS (continued)

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. This Completion Time is modified by a Note to clarify that the Risk Informed Completion Time Program is not applicable to a Required Action associated with a Condition that represents a loss of safety function, as defined in TS 5.11.b.

Because of the redundancy of sensors available to provide initiation signals and the redundancy of the onsite AC power source design, an allowable out of service time of 24 hours is provided to permit restoration of any inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, Condition D must be entered and its Required Action taken. The Required Actions do not allow placing the channel in trip since this action would cause the initiation.

C.1

With one or more channels of a Function inoperable, the Function is not capable of performing the intended function. Therefore, only 1 hour is allowed to restore the inoperable channel to OPERABLE status. If the inoperable channel cannot be restored to OPERABLE status within the allowable out of service time, the channel must be placed in the tripped condition per Required Action C.1. Placing the inoperable channel in trip would conservatively compensate for the inoperability, restore capability to accommodate a single failure, and allow operation to continue. Alternately, if it is not desired to place the channel in trip (e.g., as in the case where placing the channel in trip would result in a bus transfer and DG initiation), Condition D must be entered and its Required Action taken.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. The 1 hour Completion Time is acceptable because it minimizes risk while allowing time for restoration or tripping of channels.

D.1, D.2.1, and D.2.2

If any Required Action and associated Completion Time of Condition B or C is not met, the associated Function may not be capable of performing the intended function. Therefore, the associated DG(s) are declared inoperable immediately (Required Action D.1). This requires entry into applicable Conditions and Required Actions of LCO 3.8.1 which provide appropriate actions for the inoperable DG(s). Alternately, for Functions 1.c and 1.d only, the TR-B loss of voltage instrumentation, the offsite circuit supply breaker to the associated 4.16 kV ESF bus must be opened immediately (Required Action D.2.1) and the associated offsite circuit declared inoperable immediately (Required Action D.2.2). These alternate Required Actions also provide appropriate compensatory measures since the TR-B loss of voltage instrumentation only affects the loss of voltage trip capability of the alternate offsite circuit.

BASES

APPLICABILITY

All ECCS subsystems are required to be OPERABLE during MODES 1, 2, and 3 when there is considerable energy in the reactor core and core cooling would be required to prevent fuel damage in the event of a break in the primary system piping. In MODES 2 and 3, the ADS function is not required when pressure is ≤ 150 psig because the low pressure ECCS subsystems (LPCS and LPCI) are capable of providing flow into the RPV below this pressure. Requirements for MODES 4 and 5 are specified in LCO 3.5.2, "RPV Water Inventory Control."

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable HPCS subsystem. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable HPCS subsystem and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

A.1

If any one low pressure ECCS injection/spray subsystem is inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE subsystems provide adequate core cooling during a LOCA. However, overall ECCS reliability is reduced because a single failure in one of the remaining OPERABLE subsystems concurrent with a LOCA may result in the ECCS not being able to perform its intended safety function. The 7 day Completion Time is based on a reliability study (Ref. 13) that evaluated the impact on ECCS availability by assuming that various components and subsystems were taken out of service. The results were used to calculate the average availability of ECCS equipment needed to mitigate the consequences of a LOCA as a function of allowed outage times (i.e., Completion Times).

or in accordance with the Risk Informed Completion Time Program.

B.1 and B.2

or in accordance with the Risk Informed Completion Time Program

If the HPCS System is inoperable, and the RCIC System is immediately verified to be OPERABLE (when RCIC is required to be OPERABLE), the HPCS System must be restored to OPERABLE status within 14 days. In this condition, adequate core cooling is ensured by the OPERABILITY of the redundant and diverse low pressure ECCS injection/spray subsystems in conjunction with the ADS. Also, the RCIC System will automatically provide makeup water at most reactor operating pressures. Immediate verification of RCIC OPERABILITY is therefore required when HPCS is inoperable and RCIC is required to be OPERABLE. This may be performed by an administrative check, by examining logs or other

BASES

ACTIONS (continued)

information, to determine if RCIC is out of service for maintenance or other reasons. It is not necessary to perform the Surveillances needed to demonstrate the OPERABILITY of the RCIC System. However, if the OPERABILITY of the RCIC System cannot be immediately verified and RCIC is required to be OPERABLE, Condition D must be immediately entered. If a single active component fails concurrent with a design basis LOCA, there is a potential, depending on the specific failure, that the minimum required ECCS equipment will not be available. A 14 day Completion Time is based on the results of a reliability study (Ref. 13) and has been found to be acceptable through operating experience.

C.1

or in accordance with the Risk Informed Completion Time Program

With two ECCS injection subsystems inoperable or one ECCS injection and one ECCS spray subsystem inoperable, at least one ECCS injection/spray subsystem must be restored to OPERABLE status within 72 hours. In this condition, the remaining OPERABLE subsystems provide adequate core cooling during a LOCA. However, overall ECCS reliability is reduced in this Condition because a single failure in one of the remaining OPERABLE subsystems concurrent with a design basis LOCA may result in the ECCS not being able to perform its intended safety function. Since the ECCS availability is reduced relative to Condition A, a more restrictive Completion Time is imposed. The 72 hours Completion Time is based on a reliability study, as provided in Reference 13.

D.1

If any Required Action and associated Completion Time of Condition A, B, or C are not met, the plant must be brought to a MODE in which overall plant risk is minimizied. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 17) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action D.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable,

BASES

ACTIONS (continued)

because LCO 3.0.4.b requires performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

E.1

The LCO requires six ADS valves to be OPERABLE to provide the ADS function. Reference 14 contains the results of an analysis that evaluated the effect of two ADS valves being out of service. This analysis showed that assuming a failure of the HPCS System, operation of only five ADS valves will provide the required depressurization. However, overall reliability of the ADS is reduced because a single failure in the OPERABLE ADS valves could result in a reduction in depressurization capability. Therefore, operation is only allowed for a limited time. The 14 day Completion Time is based on a reliability study (Ref. 13) and has been found to be acceptable through operating experience.

F.1 and F.2

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

If any one low pressure ECCS injection/spray subsystem is inoperable in addition to one required ADS valve inoperable, adequate core cooling is ensured by the OPERABILITY of HPCS and the remaining low pressure ECCS injection/spray subsystems. However, the overall ECCS reliability is reduced because a single active component failure concurrent with a design basis LOCA could result in the minimum required ECCS equipment not being available. Since both a high pressure (ADS) and low pressure subsystem are inoperable, a more restrictive Completion Time of 72 hours is required to restore either the low pressure ECCS injection/spray subsystem or the ADS valve to OPERABLE status. This Completion Time is based on a reliability study (Ref. 13) and has been found to be acceptable through operating experience.

BASES

APPLICABLE SAFETY ANALYSES

The function of the RCIC System is to respond to transient events by providing makeup coolant to the reactor. The RCIC System is not an Engineered Safety Feature System and no credit is taken in the safety analyses for RCIC System operation. Based on its contribution to the reduction of overall plant risk, however, the system satisfies Criterion 4 of Reference 3.

LCO

The OPERABILITY of the RCIC System provides adequate core cooling such that actuation of any of the ECCS subsystems is not required in the event of RPV isolation accompanied by a loss of feedwater flow. The RCIC System has sufficient capacity to maintain RPV inventory during an isolation event. Management of gas voids is important to RCIC System OPERABILITY.

APPLICABILITY

The RCIC System is required to be OPERABLE in MODE 1, and MODES 2 and 3 with reactor steam dome pressure > 150 psig since RCIC is the primary non-ECCS water source for core cooling when the reactor is isolated and pressurized. In MODES 2 and 3 with reactor steam dome pressure ≤ 150 psig, the ECCS injection/spray subsystems can provide sufficient flow to the vessel. In MODES 4 and 5, RCIC is not required to be OPERABLE since RPV water inventory control is required by LCO 3.5.2, "RPV Water Level Inventory Control."

ACTIONS

A Note prohibits the application of LCO 3.0.4.b to an inoperable RCIC system. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable RCIC system and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

A.1 and A.2

If the RCIC System is inoperable during MODE 1, or MODES 2 or 3 with reactor steam dome pressure > 150 psig, and the HPCS System is immediately verified to be OPERABLE, the RCIC System must be restored to OPERABLE status within 14 days or in accordance with the Risk Informed Completion Time Program. In this Condition, loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high RPV pressure since the HPCS System is the only high pressure system assumed to function during a loss of coolant accident (LOCA). OPERABILITY of the HPCS is therefore immediately verified when the RCIC System is inoperable. This may be performed as an administrative check, by examining logs or other information, to determine if the HPCS is out of service for maintenance or other reasons. Verification does not require performing the Surveillances needed to demonstrate the OPERABILITY of the HPCS System. If the

ACTIONS (continued)

Required Action B.3 is modified by a Note that applies to air lock doors located in high radiation areas or areas with limited access due to inerting and allows these doors to be verified locked closed by use of administrative controls. Allowing verification by administrative controls is considered acceptable, since access to these areas is typically restricted. Therefore, the probability of misalignment of the door, once it has been verified to be in the proper position, is small.

C.1, C.2, and C.3

If the air lock is inoperable for reasons other than those described in Condition A or B, Required Action C.1 requires action to be immediately initiated to evaluate containment overall leakage rates using current air lock leakage test results. An evaluation is acceptable since it is overly conservative to immediately declare the primary containment inoperable if both doors in the air lock have failed a seal test or if the overall air lock leakage is not within limits. In many instances (e.g., only one seal per door has failed) primary containment remains OPERABLE, yet only 1 hour (according to LCO 3.6.1.1) would be provided to restore the air lock door to OPERABLE status prior to requiring a plant shutdown. In addition, even with both doors failing the seal test, the overall containment leakage rate can still be within limits.

Required Action C.2 requires that one door in the primary containment air lock must be verified closed. This Required Action must be completed within the 1 hour Completion Time. This specified time period is consistent with the ACTIONS of LCO 3.6.1.1, which require that primary containment be restored to OPERABLE status within 1 hour.

or in accordance with the Risk Informed Completion Time Program

Additionally, the air lock must be restored to OPERABLE status within 24 hours (Required Action C.3). The 24 hour Completion Time is reasonable for restoring the inoperable air lock to OPERABLE status considering that at least one door is maintained closed in the air lock.

D.1 and D.2

If the inoperable primary containment air lock cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

ACTIONS (continued)

The ACTIONS are modified by Notes 3 and 4. Note 3 ensures appropriate remedial actions are taken, if necessary, if the affected system(s) are rendered inoperable by an inoperable PCIV (e.g., an Emergency Core Cooling System subsystem is inoperable due to a failed open test return valve). Note 4 ensures appropriate remedial actions are taken when the primary containment leakage limits are exceeded. Pursuant to LCO 3.0.6, these ACTIONS are not required even when the associated LCO is not met. Therefore, Notes 3 and 4 are added to require the proper actions be taken.

A.1 and A.2

With one or more penetration flow paths with one PCIV inoperable except for secondary containment bypass leakage rate, MSIV leakage rate, or hydrostatically tested lines leakage rate not within limits, the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, a blind flange, and a check valve with flow through the valve secured. For penetrations isolated in accordance with Required Action A.1, the device used to isolate the penetration should be the closest available one to the primary containment. The Required Action must be completed within the 4 hour Completion Time (8 hours for main steam lines). The specified time period of 4 hours is reasonable considering the time required to isolate the penetration and the relative importance of supporting primary containment OPERABILITY during MODES 1, 2, and 3. For main steam lines, an 8 hour Completion Time is allowed. The Completion Time of 8 hours for the main steam lines allows a period of time to restore the MSIVs to OPERABLE status given the fact that MSIV closure will result in isolation of the main steam line(s) and a potential for plant shutdown.

or in accordance with the Risk Informed Completion Time Program

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

For affected penetrations that have been isolated in accordance with Required Action A.1, the affected penetration flow path must be verified to be isolated on a periodic basis. This is necessary to ensure that primary containment penetrations required to be isolated following an accident, and no longer capable of being automatically isolated, will be in the isolation position should an event occur. This Required Action does not require any testing or device manipulation. Rather, it involves verification that those devices outside primary containment and capable of being mispositioned are in the correct position. The Completion Time for this verification of "once per 31 days for isolation devices outside primary containment, drywell, and steam tunnel," is appropriate because the

following isolation

BASES

ACTIONS (continued)

C.1 and C.2

When one or more penetration flow paths with one PCIV inoperable except for secondary containment bypass leakage rate, MSIV leakage rate, or hydrostatically tested lines leakage rate not within limits, the inoperable valve must be restored to OPERABLE status or the affected penetration flow path must be isolated. The method of isolation must include the use of at least one isolation barrier that cannot be adversely affected by a single active failure. Isolation barriers that meet this criterion are a closed and de-activated automatic valve, a closed manual valve, and a blind flange. A check valve may not be used to isolate the affected penetration. Required Action C.1 must be completed within 4 hours for lines other than excess flow check valve (EFCV) lines and 72 hours for EFCV lines. The 4 hour Completion Time is reasonable considering the relative stability of the closed system (hence, reliability) to act as a penetration isolation boundary and the relative importance of supporting primary containment OPERABILITY during MODES 1, 2, and 3. The Completion Time of 72 hours for EFCVs is also reasonable considering the mitigating effects of the small pipe diameter and restricting orifice, and the isolation boundary provided by the instrument. In the event the affected penetration is isolated in accordance with Required Action C.1, the affected penetration flow path must be verified to be isolated on a periodic basis. This is necessary to ensure that primary containment penetrations required to be isolated following an accident are isolated. This Required Action does not require any testing or valve manipulation. Rather, it involves verification that those devices outside containment and capable of potentially being mispositioned are in the correct position. The Completion Time of "once per 31 days for isolation devices outside primary containment" is appropriate because the devices are operated under administrative controls and the probability of their misalignment is low. For the valves inside primary containment, the time period specified "prior to entering MODE 2 or 3 from MODE 4 if primary containment was de-inerted while in MODE 4, if not performed within the previous 92 days" is based on engineering judgement and is considered reasonable in view of the inaccessibility of the devices and other administrative controls ensuring that device misalignment is an unlikely possibility.

following isolation

Condition C is modified by a Note indicating this Condition is applicable only to those penetration flow paths with only one PCIV. For penetration flow paths with two PCIVs, Conditions A and B provide the appropriate Required Actions. This Note is necessary since this Condition is written specifically to address those penetrations with a single PCIV.

APPLICABLE SAFETY ANALYSIS (continued)

The RHR drywell spray satisfies Criterion 3 of Reference 2.

LCO

In the event of a Design Basis Accident (DBA), a minimum of one RHR drywell spray subsystem is required to mitigate the effects of potential bypass leakage paths and maintain the primary containment peak pressure below design limits. To ensure that these requirements are met, two RHR drywell spray subsystems must be OPERABLE. Therefore, in the event of an accident, at least one subsystem is OPERABLE assuming the worst case single active failure. An RHR drywell spray subsystem is OPERABLE when the pump and associated piping, valves, instrumentation, and controls are OPERABLE. Management of gas voids is important to RHR Drywell Spray System OPERABILITY.

APPLICABILITY

In MODES 1, 2, and 3, a DBA (line break inside primary containment) could cause pressurization of primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining RHR drywell spray subsystems OPERABLE is not required in MODE 4 or 5.

ACTIONS

A.1

With one RHR drywell spray subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining OPERABLE RHR drywell spray subsystem is adequate to perform the primary containment bypass leakage mitigation function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment bypass leakage mitigation capability. The 7 day Completion Time was chosen in light of the redundant RHR drywell spray capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

or in accordance with the Risk Informed Completion Time Program

B.1

With two RHR drywell spray subsystems inoperable, one subsystem must be restored to OPERABLE status within 8 hours. In this condition, there is a substantial loss of the primary containment bypass leakage mitigation function.

The 8 hour Completion Time is based on this loss of function and is considered acceptable due to the low probability of a DBA and because alternative methods to reduce primary containment pressure are available.

BASES

ACTIONS

A Note has been added to provide clarification that, for the purpose of this LCO, separate Condition entry is allowed for each penetration flow path.

A.1

With one or more lines with one vacuum breaker not closed, the leak tight primary containment boundary may be threatened. Therefore, the inoperable vacuum breakers must be restored to OPERABLE status or the open vacuum breaker closed within 72 hours. The 72 hour Completion Time is consistent with requirements for inoperable suppression chamber-to-drywell vacuum breakers in LCO 3.6.1.7, "Suppression Chamber-to-Drywell Vacuum Breakers." The 72 hour Completion Time takes into account the redundant capability afforded by the remaining breakers, the fact that the OPERABLE breaker in each of the lines is closed, and the low probability of an event occurring that would require the vacuum breakers to be OPERABLE during this period.

B.1

With one or more lines with two vacuum breakers not closed, primary containment integrity is not maintained. Therefore, one open vacuum breaker must be closed within 1 hour. This Completion Time is consistent with the ACTIONS of LCO 3.6.1.1, "Primary Containment," which requires that primary containment be restored to OPERABLE status within 1 hour.

C.1

With one line with one or more vacuum breakers inoperable for opening, the leak tight primary containment boundary is intact and the remaining vacuum breakers in the other two lines are capable of providing the vacuum relief function. However, overall system reliability is reduced because a single failure in one of the vacuum breakers in the remaining two lines could threaten the ability to mitigate an event that causes a containment depressurization. Therefore, the inoperable vacuum breaker must be restored to OPERABLE status within 72 hours. This is consistent with the Completion Time for Condition A and the fact that the leak tight primary containment boundary is being maintained.

or in accordance with the Risk Informed Completion Time

BASES

APPLICABILITY (continued)

of the drywell. The limiting pressure and temperature of the primary system prior to a DBA occur in MODES 1, 2, and 3. Excessive negative pressure inside the drywell could also occur due to inadvertent actuation of the Drywell Spray System.

In MODES 4 and 5, the probability and consequences of these events are reduced by the pressure and temperature limitations in these MODES; therefore, maintaining suppression chamber-to-drywell vacuum breakers OPERABLE is not required in MODE 4 or 5.

ACTIONS

A.1

With one of the required vacuum breakers inoperable for opening (e.g., a vacuum breaker disk is not open and may be stuck closed or not within its opening setpoint limit, so that it would not function as designed during an event that depressurized the drywell), the remaining six OPERABLE vacuum breakers are capable of providing the vacuum relief function. However, overall system reliability is reduced because a single failure in one of the remaining vacuum breakers could result in an excessive suppression chamber-to-drywell differential pressure during a DBA. Therefore, with one of the seven required vacuum breakers inoperable, 72 hours is allowed to restore at least one of the inoperable vacuum breakers to OPERABLE status so that plant conditions are consistent with those assumed for the design basis analysis. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program. The 72 hour Completion Time is considered acceptable due to the low probability of an event in which the remaining vacuum breaker capability would not be adequate.

B.1

If a required suppression chamber-to-drywell vacuum breaker is inoperable for opening and is not restored to OPERABLE status within the required Completion Time, the plant must be brought to a condition in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 3) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action B.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met.

BASES

LCO

During a DBA, a minimum of one RHR suppression pool cooling subsystem is required to maintain the primary containment peak pressure and temperature below the design limits (Ref. 2). To ensure that these requirements are met, two RHR suppression pool cooling subsystems must be OPERABLE. Therefore, in the event of an accident, at least one subsystem is OPERABLE, assuming the worst case single active failure. An RHR suppression pool cooling subsystem is OPERABLE when the pump, a heat exchanger, and associated piping, valves, instrumentation, and controls are OPERABLE. Management of gas voids is important to RHR Suppression Pool Cooling System OPERABILITY.

APPLICABILITY

In MODES 1, 2, and 3, a DBA could cause both a release of radioactive material to primary containment and a heatup and pressurization of primary containment. In MODES 4 and 5, the probability and consequences of these events are reduced due to the pressure and temperature limitations in these MODES. Therefore, the RHR Suppression Pool Cooling System is not required to be OPERABLE in MODE 4 or 5.

ACTIONS

A.1

With one RHR suppression pool cooling subsystem inoperable, the inoperable subsystem must be restored to OPERABLE status within 7 days. In this condition, the remaining RHR suppression pool cooling subsystem is adequate to perform the primary containment cooling function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in reduced primary containment cooling capability. The 7 day Completion Time is acceptable in light of the redundant RHR suppression pool cooling capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

B.1

If one RHR suppression pool cooling subsystem is inoperable and is not restored to OPERABLE status within the required Completion Time, the plant must be brought to a condition in which overall plant risk is minimized. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 5) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

BASES

APPLICABILITY

In MODES 1, 2, and 3, the SW System and UHS are required to be OPERABLE to support OPERABILITY of equipment serviced by the SW System and UHS that is required to be OPERABLE in these MODES.

Although the LCO for the SW System and UHS are not applicable in Modes 4 and 5, the capability of the SW System and the UHS to perform their necessary related support functions may be required for OPERABILITY of supported systems.

ACTIONS

A.1

With average sediment depth in either or both spray ponds ≥ 0.5 and < 1.0 ft, water inventory is reduced such that the combined cooling capability of both spray ponds may be less than required for 30 days of operation after a LOCA. Therefore, action must be taken to restore average sediment depth to < 0.5 ft. The Completion Time of 30 days is based on engineering judgment and plant operating experience and takes into consideration the low probability of a design basis accident occurring in this time period.

or in accordance with the Risk Informed Completion Time Program.

B.1

If one SW subsystem is inoperable, it must be restored to OPERABLE status within 72 hours. With the unit in this condition, the remaining OPERABLE SW subsystem is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE SW subsystem could result in loss of SW function. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

The Required Action is modified by two Notes indicating that the applicable Conditions of LCO 3.8.1, "AC Sources - Operating," and LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown," be entered and the Required Actions taken if the inoperable SW subsystem results in an inoperable DG or RHR shutdown cooling subsystem, respectively. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for these components.

BASES

ACTIONS (continued)

of inoperable features associated with a division redundant to the division that has no offsite power.

The Completion Time for Required Action A.2 is intended to allow time for the operator to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. The division has no offsite power supplying its loads; and

b. A redundant required feature on another division is inoperable.

If, at any time during the existence of this Condition (one offsite circuit inoperable), a redundant required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering no offsite power to one division of the onsite Class 1E Power Distribution System coincident with one or more inoperable required support or supported features, or both, that are associated with the other division that has offsite power, results in starting the Completion Times for the Required Action. Twenty-four hours is acceptable because it minimizes risk while allowing time for restoration before the unit is subjected to transients associated with shutdown.

The remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection may have been lost for the required feature's function; however, function is not lost. The 24 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 24 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

A.3

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

According to Regulatory Guide 1.93 (Ref. 9), operation may continue in Condition A for a period that should not exceed 72 hours. With one offsite circuit inoperable, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the plant safety systems. In this Condition, however, the remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E distribution system.

BASES

ACTIONS (continued)

on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and low probability of a DBA occurring during this period.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG(s), SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other DGs, the other DGs are declared inoperable upon discovery, and Condition E or G of LCO 3.8.1 is entered, as applicable. Once the failure is repaired, and the common cause failure no longer exists, Required Action B.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG(s), performance of SR 3.8.1.2 within 24 hours, if not performed within the past 24 hours, suffices to provide assurance of continued OPERABILITY of those DG(s).

In the event the inoperable DG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the corrective action program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

If while the DG is inoperable, a new problem with the DG is discovered that would have prevented the DG from performing its specified safety function, a separate entry into Condition B is not required. The new DG problem should be addressed in accordance with the corrective action program.

According to Generic Letter 84-15 (Ref. 10), 24 hours is a reasonable time to confirm that the OPERABLE DG(s) are not affected by the same problem as the inoperable DG.

B.4

In Condition B, the remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution system. The 72 hour Completion Time for Required Action B.4~~.1~~ takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period. Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

ACTIONS (continued)

A second optional set of Actions is provided, that if the risk management actions for establishing the alternate AC sources to division 1 or division 2 (AACS) occurs within the 72 hours Completion Time limit, an extended Completion Time up to 14 days from the DG's initial inoperability is allowed.

Alternatively, a Completion Time can be determined in accordance iwth the Risk Informed Completion Time Program.

To establish the AACS, the DG-3 cross-connection to power selected safe shutdown loads is available and an additional AC source, a 480-volt diesel generator (DG-4), is staged and available. The AACS is considered available when DG-3 cross-connection can be implemented in accordance with the emergency procedures for a loss of offsite power or a station blackout event within 2 hours and DG-4 can be aligned and supplying the battery chargers within 4 hours. Additional risk management actions in accordance with the configuration risk management program required by 10 CFR 50.65a(4) are to be put in place to assure that significant risk configurations are avoided during the extended DG inoperability.

ACTIONS (continued)

However, two factors tend to decrease the severity of this degradation level:

a. The configuration of the redundant AC electrical power system that remains available is not susceptible to a single bus or switching failure; and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite AC source.

With both of the offsite circuits inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

According to Regulatory Guide 1.93 (Ref. 9), with the available offsite AC sources two less than required by the LCO, operation may continue for 24 hours. If two offsite sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition A.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

D.1 and D.2

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it were inoperable, resulting in de-energization. Therefore, the Required Actions of Condition D are modified by a Note to indicate that when Condition D is entered with no AC source to any division, Actions for LCO 3.8.7, "Distribution Systems - Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of the offsite circuit and one DG without regard to whether a division is de-energized. LCO 3.8.7 provides the appropriate restrictions for a de-energized division.

BASES

ACTIONS (continued)

According to Regulatory Guide 1.93 (Ref. 9), operation may continue in Condition D for a period that should not exceed 12 hours. In Condition D, individual redundancy is lost in electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition C (loss of both offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and low probability of a DBA occurring during this period.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

E.1

With two DGs inoperable, there is one remaining standby AC source. Thus, with an assumed loss of offsite electrical power, insufficient standby AC sources are available to power the minimum required ESF functions. Since the offsite electrical power system is the only source of AC power for the majority of ESF equipment at this level of degradation, the risk associated with continued operation for a very short time could be less than that associated with an immediate controlled shutdown (the immediate shutdown could cause grid instability, which could result in a total loss of AC power). Since any inadvertent generator trip could also result in a total loss of offsite AC power, however, the time allowed for continued operation is severely restricted. The intent here is to avoid the risk associated with an immediate controlled shutdown and to minimize the risk associated with this level of degradation.

According to Regulatory Guide 1.93 (Ref. 9), with both DGs inoperable, operation may continue for a period that should not exceed 2 hours. This Completion Time assumes complete loss of onsite (DG) AC capability to power the minimum loads needed to respond to analyzed events. In the event Division 3 DG in conjunction with Division 1 or 2 DG is inoperable, with the other Division 1 or 2 DG remaining, a significant spectrum of breaks would be capable of being responded to with onsite power. Even the worst case event would be mitigated to some extent—an extent greater than a typical two division design in which this condition represents complete loss of onsite power function. Given the remaining function, a 24 hour Completion Time is appropriate. At the end of this 24 hour period, Division 3 systems (HPCS) could be declared inoperable (see Applicability Note) and this Condition could be exited with only one required DG remaining inoperable. However, with a Division 1 or 2 DG remaining inoperable and the HPCS declared inoperable, a redundant required feature failure exists, according to Required Action B.2.

BASES

ACTIONS (continued)

Required Action A.2, B.2, or C.2 requires that the battery float current be verified as less than or equal to 2 amps. This indicates that, if the battery had been discharged as the result of the inoperable battery charger, it has now been fully recharged. If, at the expiration of the initial 12 hour period, the battery float current is not less than or equal to 2 amps, this indicates there may be additional battery problems and the battery must be declared inoperable.

or in accordance with the Risk Informed Completion Time Program

Required Action A.3, B.3, or C.3 limits the restoration time for the inoperable battery charger to 72 hours. This action is applicable if an alternate means of restoring battery terminal voltage to greater than or equal to the minimum established float voltage has been used (e.g., balance of plant non-Class 1E battery charger). The alternate means will be a charger of sufficient capacity such that it is fully capable of restoring the battery voltage to the minimum acceptable limits, carrying respective DC bus loads, and maintaining the battery in a fully charged condition. The 72 hour Completion Time is aligned with the standard 72 hour Completion Time of Technical Specification LCO 3.8.1 Required Action B.4.1.

D.1, E.1, and F.1

Condition D, E, or F represents one division with one battery inoperable. With one battery inoperable, the DC bus is being supplied by the OPERABLE battery charger(s). Any event that results in a loss of the AC bus supporting the battery charger(s) will also result in loss of DC to that division. Recovery of the AC bus, especially if it is due to a loss of offsite power, will be hampered by the fact that many of the components necessary for the recovery (e.g., diesel generator control and field flash, AC load shed and diesel generator output circuit breakers, etc.) likely rely upon the battery. In addition, the energization transients of any DC loads that are beyond the capability of the battery charger(s) and normally require the assistance of the battery will not be able to be brought online. The 2 hour limit allows sufficient time to effect restoration of an inoperable battery given that the majority of the conditions that lead to battery inoperability (e.g., loss of battery charger, battery cell voltage less than 2.07 V, etc.) are identified in Specifications 3.8.4, 3.8.5, and 3.8.6 together with additional specific completion times.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

BASES

ACTIONS (continued)

G.1

Condition G represents one division with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of 125 VDC power to the affected division. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system division.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

If one of the required Division 1 or 2 125 VDC electrical power subsystems is inoperable for reasons other than Condition A or D (e.g., inoperable battery charger and associated inoperable battery), the remaining 125 VDC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of minimum necessary 125 VDC electrical subsystems, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 10) and reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

H.1

If the Required Actions and associated Completion Times of Condition B or E are not met, the Division 3 DC electrical power subsystem inoperable for reasons other than Condition B or E, or any combination of these condition exists, the HPCS System may be incapable of performing its intended function and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions of LCO 3.5.1, "ECCS - Operating."

I.1

If the Required Actions and associated Completion Times of Condition C or F are not met, the Division 1 250 VDC electrical power subsystem inoperable for reasons other than Condition C or F, or any combination of these conditions exists, the RCIC and other associated supported features may be incapable of performing their intended functions and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions for the associated supported features.

BASES

ACTIONS

A.1

With one or more Division 1 or 2 required AC buses, load centers, motor control centers, or distribution panels, in one division inoperable, the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

Alternatively, a Completion Time can be determined in accordance with the Risk Informed Completion Time Program.

The Condition A worst scenario is one division without AC power (i.e., no offsite power to the division and the associated DG inoperable). In this Condition, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operators' attention be focused on minimizing the potential for loss of power to the remaining division by stabilizing the unit and restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

a. The potential for decreased safety if the unit operators' attention is diverted from the evaluations and actions necessary to restore power to the affected division to the actions associated with taking the unit to shutdown within this time limit.

b. The low potential for an event in conjunction with a single failure of a redundant component in the division with AC power. (The redundant component is verified OPERABLE in accordance with Specification 5.5.11, "Safety Function Determination Program (SFDP).")

BASES

ACTIONS (continued)

B.1

With Division 1 or 2 125 VDC buses in one division inoperable, the remaining DC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining DC electrical power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required DC electrical power distribution subsystem must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

or in accordance with the Risk Informed Completion Time Program

Condition B represents one division without adequate 125 VDC power, potentially with both the battery significantly degraded and the associated charger nonfunctioning. In this situation, the plant is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the plant, minimizing the potential for loss of power to the remaining divisions, and restoring power to the affected division.

This 2 hour limit is more conservative than Completion Times allowed for the majority of components that could be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, that would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

a. The potential for decreased safety when requiring a change in plant conditions (i.e., requiring a shutdown) while not allowing stable operations to continue;

b. The potential for decreased safety when requiring entry into numerous applicable Conditions and Required Actions for components without DC power while not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected division; and

Attachment 4

Cross-Reference of TSTF-505 and Columbia Generating Station Technical Specifications

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Completion Times	**1.3**	**1.3**		
Example 1.3-8	Example 1.3-8	Example 1.3-8	Yes	TSTF-505 changes are incorporated. Administrative changes have been made to Example 1.3-8 to reflect Columbia’s typical TS shutdown actions.
Standby Liquid Control (SLC) System	**3.1.7**	**3.1.7**		
One SLC subsystem inoperable.	3.1.7.B.1	3.1.7.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function because the remaining operable subsystem is adequate to perform the licensing basis shutdown function.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Reactor Protection System (RPS) Instrumentation	**3.3.1.1**	**3.3.1.1**		
One or more required channels inoperable.	3.3.1.1.A.1	3.3.1.1.A.1	Yes	TSTF-505 changes are incorporated.
	3.3.1.1.A.2	3.3.1.1.A.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, with two or more channels inoperable, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. Required Action A.2 contains a Note which is not contained in NUREG-1434. The Note limits Required Action A.2 from being applied to Table 3.3.1.1-1 Functions 2.a through 2.d, and 2.f (Average Power Range Monitors). See Attachment 6 for additional discussion. The RPS is not modeled explicitly in the PRA. The PRA model uses a single point estimate event to represent RPS failure from electrical SSCs. See discussion in Enclosure 1.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Reactor Protection System (RPS) Instrumentation (continued)	**3.3.1.1**	**3.3.1.1**		
One or more Functions with one or more required channels inoperable in both trip systems.	3.3.1.1.B.1	3.3.1.1.B.1	Yes	TSTF-505 changes are incorporated.
	3.3.1.1.B.2	3.3.1.1.B.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, with two or more channels inoperable, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. Condition B contains a Note which is not contained in NUREG-1434. The Note limits Condition B from being applied to Table 3.3.1.1-1 Functions 2.a through 2.d, and 2.f (Average Power Range Monitors). See Attachment 6 for additional discussion. The RPS is not modeled explicitly in the PRA. The PRA model uses a single point estimate event to represent RPS failure from electrical SSCs. See discussion in Enclosure 1.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Source Range Monitor (SRM) Instrumentation	**3.3.1.2**	**3.3.1.2**		
One or more required SRMs inoperable in MODE 2 with intermediate range monitors (IRMs) on Range 2 or below.	3.3.1.2.A.1	3.3.1.2.A.1	No	The SRMs are not modeled in the CGS Probabilistic Risk Assessment (PRA) model, therefore, they are not included in the RICT Program.
Feedwater and Main Turbine High Water Level Trip Instrumentation	**3.3.2.2** **(NUREG-1433)**	**3.3.2.2**		
One feedwater and main turbine high water level trip channel inoperable.	3.3.2.2.A.1	3.3.2.2.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function because, per Bases, the remaining two OPERABLE channels can provide the required trip signal.
Two or more feedwater and main turbine high water level trip channels inoperable.	3.3.2.2.B.1	3.3.2.2.B.1	No	The design of the CGS is such that this condition represents a loss of function per TS Bases. Therefore, the TSTF-505 changes are not incorporated.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation	**3.3.4.1**	**3.3.4.1**		
One or more required channels inoperable.	3.3.4.1.A.1 3.3.4.1.A.2	3.3.4.1.A.1 3.3.4.1.A.2	Yes Yes	TSTF-505 changes are incorporated. There is no loss of function because the trip capability is retained and the EOC-RPT System is capable of performing the intended function.
Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation	**3.3.4.2**	**3.3.4.2**		
One or more channels inoperable	3.3.4.2.A.1 3.3.4.2.A.2	3.3.4.2.A.1 3.3.4.2.A.2	Yes Yes	TSTF-505 changes are incorporated. TSTF-505 changes are incorporated. There is no loss of function because the trip capability is maintained and the ATWS-RPT System is capable of performing the intended function for one of the recirculation pumps.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Emergency Core Cooling System (ECCS) Instrumentation	**3.3.5.1**	**3.3.5.1**		
As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	3.3.5.1.B.3	3.3.5.1.B.3	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.
As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	3.3.5.1.C.2	3.3.5.1.C.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.
As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	3.3.5.1.D.2.1	3.3.5.1.D.2.1	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.
As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	3.3.5.1.E.2	3.3.5.1.E.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1

Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Emergency Core Cooling System (ECCS) Instrumentation (continued)	**3.3.5.1**	**3.3.5.1**		
As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	3.3.5.1.F.2	3.3.5.1.F.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. The RICT insert format is modified from TSTF-505, Revision 2. This format is consistent with Columbia TS 1.2, "Logical Connectors", which requires the use of first level logic for Completion Times.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Emergency Core Cooling System (ECCS) Instrumentation (continued)	**3.3.5.1**	**3.3.5.1**		
As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	3.3.5.1.G.2	3.3.5.1.G.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. The RICT insert format is modified from TSTF-505, Revision 2, to align with Columbia TS 1.2, "Logical Connectors", direction to only use first level logic for Completion Times.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Reactor Core Isolation Cooling (RCIC) System Instrumentation	**3.3.5.2**	**3.3.5.3**		
As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	3.3.5.2.B.2	3.3.5.3.B.2	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.
As required by Required Action A.1 and referenced in Table 3.3.5.2-1.	3.3.5.2.D.2.1	3.3.5.3.D.2.1	Yes	TSTF-505 changes are incorporated. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.
Primary Containment Isolation Instrumentation	**3.3.6.1** **NUREG-1433**	**3.3.6.1**		
One or more required channels inoperable.	3.3.6.1.A.1	3.3.6.1.A.1	Yes	TSTF-505 changes are incorporated. Per the TS Bases, however, with multiple channels inoperable, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. NUREG-1433 Items 7.a and 7.b are equal to CGS Items 6.a and 6.b.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Residual Heat Removal (RHR) Containment Spray System Instrumentation	**3.3.6.3**			
As required by Required Action A.1 and Referenced in Table 3.3.6.3-1	3.3.6.3.B.2	---------------	No	The CGS TS do not contain this LCO.
As required by Required Action A.1 and Referenced in Table 3.3.6.3-1	3.3.6.3.C.2	---------------	No	The CGS TS do not contain this LCO.
Relief and Low-Low Set (LLS) Instrumentation	**3.3.6.5**			
One trip system inoperable.	3.3.6.5.A.1	---------------	No	The CGS TS do not contain this LCO.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1

Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Loss of Power (LOP) Instrumentation	**3.3.8.1**	**3.3.8.1**		
One or more channels inoperable.	3.3.8.1.A.1	3.3.8.1.A.1	No	CGS TS Condition A.1 Directs Entry into Condition Referenced in Table 3.3.8.1 for the channel, with a Completion Time of Immediately, therefore RICT is not applicable
As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	---------------	3.3.8.1.B.2	Yes	Condition B is plant specific. For those functions identified in Table 3.3.8.1-1, Required Actions B.1 and B.2 allow one hour to declare the associated DG inoperable and 24 hours to restore the channel to OPERABLE status, respectively. Condition B is intended to ensure that appropriate actions are taken if multiple, inoperable channels within the same Function result in loss of voltage initiation capability being lost for a DG. Completion Time B.2 meets the TSTF-505 criteria for inclusion in the RICT Program. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred. The loss of DG(s) initiation capability prompts entry into LCO 3.8.1. See discussions in Enclosure 1, and Attachment 6.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Loss of Power (LOP) Instrumentation (continued)	**3.3.8.1**	**3.3.8.1**		
As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	3.3.8.1.A.1	3.3.8.1.C.1	Yes	Condition C most closely aligns with NUREG-1434 Condition A.1 with a Required Action to place the channel in trip and a Completion Time of 1 hour for those functions specified in Table 3.3.8.1-1. Under certain circumstances, a loss of function may occur. Therefore, a note is added which prohibits applying a RICT when a loss of function has occurred.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1

Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Safety/Relief Valves (S/RVs)	**3.4.4**	**3.4.3** **3.4.4**		**CGS TS 3.4.3 Safety/Relief Valves ≥ 25% RTP** **CGS TS 3.4.4 Safety/Relief Valves < 25% RTP**
One or more required SRVs inoperable.	3.4.4.A.1	3.4.3.A.1	No	CGS TS require reducing THERMAL POWER to < 25% RTP, therefore, this does not meet Criterion 18 for inclusion in the RICT Program.
One required SRVs inoperable.	3.4.4.A.1	3.4.4.A.1	No	CGS TS require entry into MODE 3, therefore not included in the RICT Program.
ECCS - Operating	**3.5.1**	**3.5.1**		
One low pressure ECCS injection/spray subsystem inoperable.	3.5.1.A.1	3.5.1.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function because the remaining operable subsystems provide adequate core cooling during a LOCA.
High Pressure Core Spray (HPCS) System inoperable.	3.5.1.B.2	3.5.1.B.2	Yes	TSTF-505 changes are incorporated. Function is maintained in this condition because adequate core cooling is ensured by the operability of the redundant and diverse low pressure ECCS injection/spray subsystems in conjunction with the ADS. In addition, the RCIC System will automatically provide makeup water at most reactor operating pressures.
Two ECCS injection subsystems inoperable. OR One ECCS injection and one ECCS spray subsystem inoperable.	3.5.1.C.1	3.5.1.C.1	Yes	TSTF-505 changes are incorporated. Function is maintained in this condition because the remaining operable subsystems provide adequate core cooling during a LOCA.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
ECCS – Operating (continued)	**3.5.1**	**3.5.1**		
One required ADS valve inoperable.	3.5.1.E.1	3.5.1.E.1	Yes	TSTF-505 changes are incorporated. Function is maintained in this condition because analysis has shown that, assuming a failure of the HPCS system, operation of only 5 of the 6 ADS valves will provide the required depressurization.
One required ADS valve inoperable. AND One low pressure ECCS injection/spray subsystem inoperable.	3.5.1.F.1 3.5.1.F.2	3.5.1.F.1 3.5.1.F.2	Yes Yes	TSTF-505 changes are incorporated. TSTF-505 changes are incorporated. Function is maintained because adequate core cooling is ensured by the operability of HPCS and the remaining low-pressure injection/spray subsystems.
RCIC System	**3.5.3**	**3.5.3**		
Reactor Core Isolation Cooling (RCIC) System inoperable.	3.5.3.A.2	3.5.3.A.2	Yes	TSTF-505 changes are incorporated. Function is maintained in this condition because loss of the RCIC System will not affect the overall plant capability to provide makeup inventory at high RPV pressure since the HPCS System is the only high-pressure system assumed to function during a LOCA.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Primary Containment Air Locks	**3.6.1.2**	**3.6.1.2**		
Primary containment air lock inoperable for reasons other than Condition A or B.	3.6.1.2.C.3	3.6.1.2.C.3	Yes	TSTF-505 changes are incorporated. Per TS Bases, function is maintained in this condition because at least one door is maintained closed in the air lock.
Primary Containment Isolation Valves (PCIVs)	**3.6.1.3** **NUREG-1433**	**3.6.1.3**		
NOTE: Only applicable to penetration flow paths with two PCIVs. One or more penetration flow paths with one PCIV inoperable for reasons other than Conditions D.	3.6.1.3.A.1 3.6.1.3.A.2	3.6.1.3.A.1 3.6.1.3.A.2	Yes Yes	TSTF-505 changes are incorporated. There is no loss of function since one isolation valve in the flow path remains operable. TSTF-505 change to add "following isolation" is incorporated.
NOTE: Only applicable to penetration flow paths with only one PCIV. One or more penetration flow paths with one PCIV inoperable for reasons other than Condition D.	3.6.1.3.C.2	3.6.1.3.C.2	NA	TSTF-505 to add "following isolation" incorporated.
One or more penetration flow paths with one or more containment purge valves not within purge valve leakage limits.	3.6.1.3.E.1	----------------	No	The CGS TS does not contain this Condition for containment purge valves.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Residual Heat Removal Containment Spray	**3.6.1.7**	**3.6.1.5**		**CGS TS 3.6.1.5 it titled "Residual Heat Removal (RHR) Drywell Spray"**
One RHR drywell spray subsystem inoperable.	3.6.1.7.A.1	3.6.1.5.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function in this condition because the remaining operable RHR drywell spray subsystem is adequate to perform the primary containment bypass leakage mitigation function. Also deleting historical footnote.
Reactor Building-to-Suppression Chamber Vacuum Breakers	**3.6.1.7** **NUREG-1433**	**3.6.1.6**		
One line with one or more reactor building-to-suppression chamber vacuum breakers inoperable for opening.	3.6.1.7.C.1	3.6.1.6.C.1	Yes	TSTF-505 changes are incorporated. There is no loss of function due to the remaining breakers in the other two lines being capable of providing the vacuum relief function.
Two or more lines with one or more reactor building-to-suppression chamber vacuum breakers inoperable for opening.	3.6.1.7.D.1	3.6.1.6.E.1	No	TSTF-505 changes are not incorporated. With breakers in two of the three lines inoperable for opening, the vacuum relief function is lost.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1

Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Suppression Chamber-to- Drywell Vacuum Breakers	**3.6.1.8** **NUREG-1433**	**3.6.1.7**		
One required suppression chamber-to-drywell vacuum breaker inoperable for opening.	3.6.1.8.A.1	3.6.1.7.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function in this condition because the remaining six operable vacuum breakers are capable of providing the vacuum relief function.
Residual Heat Removal (RHR) Suppression Pool Cooling	**3.6.2.3**	**3.6.2.3**		
One RHR suppression pool cooling subsystem inoperable.	3.6.2.3.A.1	3.6.2.3.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function in this condition because the remaining RHR suppression pool cooling subsystem is adequate to perform the primary containment cooling function. Remove historical footnote.
Suppression Pool Makeup (SPMU) System	**3.6.2.4**			
One SPMU subsystem inoperable for reasons other than Condition A or B.	3.6.2.4.C.1	-----------------	No	The CGS TS do not contain this LCO.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Drywell Cooling System Fans	**3.6.3.1** **NUREG-1433**	**3.6.3.2**		**CGS LCO Titled “Primary Containment Atmosphere Mixing System”**
Two head area return fans inoperable	3.6.3.1.B.2	3.6.3.2.B.2	No	Mixing fans CRA FN-4A/B are not modeled in the PRA, therefore, a RICT cannot be calculated, and this TS cannot be included in the RICT program or LAR.
Drywell Air Lock	**3.6.5.2**			
Drywell air lock inoperable for reasons other than Condition A or B.	3.6.5.2.C.3	-----------------	No	The CGS TS do not contain this LCO.
Drywell Isolation Valves	**3.6.5.3**			
One or more penetration flow paths with one drywell isolation valve inoperable.	3.6.5.3.A.1	-----------------	No	The CGS TS do not contain this LCO.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Standby Service Water (SSW) and Ultimate Heat Sink	**3.7.1**	**3.7.1**		**The CGS TS abbreviates Standby Service Water as (SW)**
One or more cooling towers with one cooling tower fan inoperable.	3.7.1.A.1	-----------------	No	The CGS TS does not contain this Required Action.
One SW subsystem inoperable	3.7.1.C.1	3.7.1.B.1	Yes	TSTF-505 changes are applied. There is no loss of function in this condition because the remaining operable SW subsystem is adequate to perform the heat removal function.
The Main Turbine Bypass System	**3.7.6**	**3.7.6**		
Requirements of the LCO not met.	3.7.6.A.1	3.7.6.A.1	No	TSTF-505 changes are not incorporated due to loss of design basis function if any main turbine bypass valves are inoperable.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
AC Sources – Operating	**3.8.1**	**3.8.1**		
One offsite circuit inoperable.	3.8.1.A.3	3.8.1.A.3	Yes	TSTF-505 changes are incorporated. There is no loss of function in this condition because the remaining operable offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E distribution system.
One required DG inoperable.	3.8.1.B.4	3.8.1.B.4.1	Yes	TSTF-505 changes are incorporated for Required Actions B.4.1 and B.4.2.2. There is no loss of function in this condition because the remaining operable offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E distribution system.
Two offsite circuits inoperable.	3.8.1.C.2	3.8.1.C.2	Yes	TSTF-505 changes are incorporated. There is no loss of function in this condition because two complete safety divisions are operable (emergency AC power is operable).
One offsite circuit inoperable. <u>AND</u> One required DG inoperable.	3.8.1.D.1 3.8.1.D.2	3.8.1.D.1 3.8.1.D.2	Yes Yes	TSTF-505 changes are incorporated. TSTF-505 changes are incorporated. There is no loss of function in this condition because the remaining operable offsite circuit and DG are adequate to supply electrical power to the onsite Class 1E distribution system.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
AC Sources – Operating (continued)	**3.8.1**	**3.8.1**		
One required automatic load sequencer inoperable.	3.8.1.F.1	---------------	No	The CGS TS does not contain this Required Action.
DC Sources – Operating	**3.8.4**	**3.8.4**		
One required Division 1 or 2 125 V DC battery charger inoperable	3.8.4.A.3	3.8.4.A.3	Yes	TSTF-505 changes are incorporated. There is no loss of function because this condition only impacts one division's required battery charger and only two of three divisions of the distribution system are needed to provide the necessary electrical power to the associated ESF components for safe shutdown.
One required Division 3 125 V DC battery charger inoperable.	3.8.4.A.3	3.8.4.B.3	Yes	TSTF-505 changes are incorporated. Functional discussion same as A.3 above.
One required Division 1 250 V DC battery charger inoperable.	3.8.4.A.3	3.8.4.C.3	Yes	TSTF-505 changes are incorporated. Functional discussion same as A.3 above.
One required Division 1 or 2 125 V DC battery inoperable.	3.8.4.B.1	3.8.4.D.1	Yes	TSTF-505 changes are incorporated. There is no loss of function because this condition only impacts one division's required battery and only two of the three divisions of the distribution system are needed to provide the necessary electrical power to the associated ESF components for safe shutdown.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
DC Sources – Operating (continued)	**3.8.4**	**3.8.4**		
One required Division 3 125 V DC battery inoperable.	3.8.4.B.1	3.8.4.E.1	Yes	TSTF-505 changes are incorporated. There is no loss of function because this condition only impacts one division's required battery and only two of the three divisions of the distribution system are needed to provide the necessary electrical power to the associated ESF components for safe shutdown.
One required Division 1 250 V DC battery inoperable.	3.8.4.B.1	3.8.4.F.1	Yes	TSTF-505 changes are incorporated. There is no loss of function because this condition only impacts one division's required battery and only two of the three divisions of the distribution system are needed to provide the necessary electrical power to the associated ESF components for safe shutdown.
Division 1 or 2 125 V DC electrical power subsystem inoperable for reasons other than Condition A or D.	3.8.4.C.1	3.8.4.G.1	Yes	TSTF-505 changes are incorporated. There is no loss of function in this condition because the remaining 125 V DC electrical subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Remove historical note.
Inverters – Operating	**3.8.7**			
One required inverter inoperable.	3.8.7.A.1	---------------	No	The CGS TS do not contain this LCO.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Table A4-1
Cross-Reference of TSTF-505 and Columbia (CGS) Technical Specifications

TS Description	TSTF-505* TS	CGS TS	Apply RICT?	Comments
Distribution Systems – Operating	**3.8.9**	**3.8.7**		
Division 1 or 2 AC electrical distribution subsystem inoperable.	3.8.9.A.1	3.8.7.A.1	Yes	TSTF-505 changes are incorporated. There is no loss of function in this scenario because the remaining AC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition.
One or more AC vital buses inoperable.	3.8.9.B.1	---------------	No	The CGS TS do not contain this Required Action.
Division 1 or 2 125 V DC electrical power distribution subsystem inoperable.	3.8.9.C.1	3.8.7.B.1	Yes	TSTF-505 changes are incorporated. There is no loss of function in this scenario because the remaining DC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition.
Programs and Manuals	**5.5**			
Programs and Manuals	5.5.15	5.5.16		The CGS TS do not currently contain this program. The new RICT Program will be added to the CGS TS 5.5.16 consistent with TSTF-505.

*Columbia TS align with TSTF-1434 unless otherwise noted.

Attachment 5

Columbia Generating Station RICT Program PRA Implementation Items

RICT Program PRA Implementation Items

1.0 INTRODUCTION

The table below identified the items that are required to be complete prior to implementation of the Risk-Informed Completion Time (RICT) Program at Columbia. All issues identified below will be addressed and any associated changes will be made.

Table A5-1: RICT Program PRA Implementation Items

Source	Description	Implementation Item
Enclosure 1 Note 1	Individual reactor protection system (RPS) instrumentation inputs to the RPS logic system are not modeled in the PRA. The RPS failure probability is based on NUREG-CR/5500 and uses a single point estimate event to represent RPS failure due to electrical equipment failures. For the RICT calculation, a probability of failure of each of the four sub-systems (channels) was developed. A simplified RPS model using the four sub-system failure events was used based on the one-out-of-two taken twice logic. This RPS model generates the exact base probability of the NUREG-CR/5500 model. For any subsystem with a function considered inoperable or bypassed, the associated subsystem event was failed in this RPS model to calculate the RICT. This simplified RPS model was validated to provide more conservative results than the NUREG-CR-5500 model when a function channel is inoperable or bypassed.	The configuration risk monitor (CRM) model will include this expanded RPS logic. The inclusion of this logic is performed as model maintenance using existing PRA methods and does not introduce any new methods or PRA upgrades.
Enclosure 1 Note 6	The Fire PRA models individual solenoid operated valves (SOVs) and dependencies for each safety relief valve (SRV) (automatic depressurization system (ADS) and non-ADS). For the RICT evaluation, the Fire PRA logic was also added to the Internal events, Internal flood, and Seismic hazards models for the quantification. Additionally, the ADS SRVs are modeled by common cause failures or their supporting SOVs and supports. For the RICT calculation, individual ADS SRV valve body independent failure-to-open events were added.	The CRM Model will apply the expanded ADS SRV logic to all hazards. The use of this logic for all hazards is performed as model maintenance using existing PRA methods and does not introduce any new methods or PRA upgrades.

Attachment 6

Evaluation of Instrumentation and Control Systems

Information Supporting Redundancy and Diversity

This attachment provides justification for TS 3.3, “Instrumentation,” that defense-in-depth objectives are met, that at least one redundant or diverse means (through other automatic features or manual action) to accomplish necessary safety functions remains available during application of the RICT. This attachment identified the components available to respond to identified accident conditions.

The following Instrumentation Technical Specifications (TS) sections are included in this TSTF-505 License Amendment Request (LAR) for Columbia Generating Station (Columbia).

1. Reactor Protection Instrumentation - TS section 3.3.1.1
2. Feedwater and Main Turbine High Water Level Trip Instrumentation – TS section 3.3.2.2
3. End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation – TS section 3.3.4.1
4. Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation – TS section 3.3.4.2
5. Emergency Core Cooling System (ECCS) Instrumentation – TS section 3.3.5.1
6. Reactor Core Isolation Cooling (RCIC) System Instrumentation – TS section 3.3.5.3
7. Primary Containment Isolation Instrumentation – TS section 3.3.6.1
8. Loss of Power (LOP) Instrumentation – TS section 3.3.8.1

Columbia TS 3.3 Instrumentation Limiting Conditions for Operation (LCOs) were developed to ensure that Columbia maintains necessary redundancy and diversity of systems, structures, and components (SSCs), and complies with the single failure design criterion as defined in IEEE 279-1971, and the diversity requirements as defined in Appendix A, “General Design Criteria for Nuclear Power Plants” to Part 50 of 10 CFR, GDC-22, “Protection System Independence.”

Included below is a description of the redundant and diverse means available to mitigate accidents that each identified instrumentation and control function defined in TS Section 3.3 is designed to prevent.

Each TS Instrumentation section, which identifies the FSAR transient/accident that credits the instrumentation and control function is presented in a tabular format except for TS Section 3.3.8.1 (TS Section 3.3.8.1 is presented in a descriptive format). For each instrumentation and control function, diverse instrumentation is identified to demonstrate that at least one diverse means is available to accomplish the associated safety function.

The following abbreviations are used within the “Event” column of the included tables:

- IMF-AOT: Incidents of moderate frequency. This event is referred to as an anticipated operational transient.
- II-AOT Infrequent incidents. This event is referred to as an abnormal operational transient.
- DBA Design basis accident. This are events that are not expected to occur.

1. Reactor Protection Instrumentation - TS section 3.3.1.1

The RPS is comprised of two independent trip systems (A and B), with two logic channels in each trip system (logic channels A1 and A2, B1 and B2). The outputs of the logic channels in a trip system are combined in a one-out-of-two logic so either channel can trip the associated trip system. The tripping of both trip systems will produce a reactor SCRAM. This logic arrangement is referred to as one out-of-two taken twice logic. Functions with a different logic are noted below.

The RPS design creates defense-in-depth from the redundancy of the channels for each trip system.

Diverse inputs trip the reactor (TS Table 3.3.1.1-1 and FSAR Table 7.2-1)

- 1. Intermediate Range Monitors: 8 instruments channels, 4 instrument channels per trip system, arranged in a 1 of 4 taken twice logic.
    - 1a. IRM Neutron Flux High
    - 1b. IRM Inop
- 2. Average Power Range Monitors: The APRM System is divided into 4 APRM channels and 4 2-Out-of-4 Voter channels. Each APRM channel provides inputs to each of the four voter channels. The four voter channels are divided into two groups of two each; with each group of two providing inputs to one RPS trip system. The system is designed to allow one APRM channel, but no voter channels, to be bypassed. A trip from any one unbypassed APRM will result in a "single vote" in all of the voter channels, but no trip inputs to either RPS trip system. Any Function 2.a, 2.b, 2.c, or 2.d trip from any two unbypassed APRM channels will result in a full trip in each of the four voter channels, which in turn results in two trip inputs into each RPS trip system logic channel (A1, A2, B1, and B2). Similarly, any Function 2.d or 2.f trip from any two unbypassed APRM channels will result in a full trip from each of the four voter channels.
    - 2a. Neutron Flux – High (setdown)
    - 2b. Simulate Thermal Power – High
    - 2c. Neutron Flux – high
    - 2d. Inop

  - 2e. 2-Out-of-4 Voter
  - 2f. OPRM Upscale
- 3. Reactor Vessel Steam Dome Pressure – High: 4 instrument channels, 2 instrument channels per trip system, arranged in a 1 of 2 taken twice logic.
- 4. Reactor Vessel Water Level – Low, Level 3: 4 instrument channels, 2 instrument channels per trip system, arranged in a 1 of 2 taken twice logic.
- 5. Main Steam Isolation Valve – Closure: 16 instrument channels, 8 instrument channels per trip system, 2 instrument channels per each of 8 valves, arranged that either inboard or outboard valve on two main steam lines in one of the trip logics in each RPS trip system must close in order for a scram to occur.
- 6. Primary Containment Pressure – High: 4 instrument channels, 2 instrument channels per trip system, arranged in a 1 of 2 taken twice logic.
- 7. Scram Discharge Volume Water Level – High: 4 instrument channels, 2 instrument channels per trip system, arranged in a 1 of 2 taken twice logic.
  - Transmitter/Level Indicating Switch
  - Transmitter Level Switch
- 8. Turbine Throttle Valve – Closure: 8 instrument channels, 4 instrument channels per trip system, 2 instrument channels per valve, arranged so that closure of 3 or more valves is required to initiate a scram.
- 9. Turbine Governor Valve Fast Closure, Trip Oil Pressure – Low: 4 instrument channels, 2 instrument channels per trip system, arranged in a 1 of 2 taken twice logic.
- 10. Reactor Mode Switch – Shutdown Position: single switch with 4 channels, 2 channels in each trip system, arranged in a 1 of 2 taken twice logic.
- 11. Manual Scram: 4 instrument channels, 2 instrument channels in each trip system, arranged in a 1 of 2 taken twice logic.

In addition, CGS has redundant and diverse methods of shutting down the reactor in the unlikely event that the RPS does not scram the reactor. The Alternate Rod Insertion (ARI) system provides backup capability to insert the control rods into the reactor and can be manually or automatically initiated. The reactor recirculation pumps have trips to reduce the reactor power via negative void reactivity feedback via the ATWS-RPT subsystem. CGS also has a Standby Liquid Control System (SLC) as an independent backup system. The system can be manually initiated via the Main Control Room keylock switches to inject boron into the Reactor Vessel and to initiate closure of the Reactor Water Clean-Up (RWCU) outboard isolation valve to prevent removal of the injected boron.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
Table 3.3.1.1-1	1. Intermediate Range Monitors				
	1a. Neutron Flux - High	15.4.1	Rod Withdrawal Error - Low Power	1) Automatic Initiation: - Rod Withdrawal Monitor - Neutron Flux - High (Setdown) 2) Manual scram	II-AOT
	1b. Inop	None	None	1) Manual scram	N/A
	2. Average Power Range Monitors				
	2a. Neutron Flux - High (Setdown)	None	None	1) Automatic Initiation - IRM Neutron Flux - High 2) Manual Initiation	N/A
	2b. Simulated Thermal Power - High	None	None	1) Automatic Initiation - Neutron Flux – high 2) Manual Initiation	N/A
	2c. Neutron Flux – high	15.1.6	Inadvertent Residual Heat Removal Shutdown Cooling Operation	1) Manual scram	IMF-AOT
		15.4.9	Control Rod Drop Accident	1) Automatic Initiation: - Banked Position Withdraw Sequence (BPWS) 2) Manual scram	DBA
		15.2.1	Pressure Regulator Failure - Closed	1) Automatic Initiation: - Reactor Vessel Steam Dome Pressure – High 2) Manual scram	IMF-AOT
	2d. Inop	None	None	1) Manual scram	N/A

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	2e. 2-Out-of-4 Voter	The Function is implicitly assumed in the accident and transient analyses.		1) Manual scram	N/A
	2f. OPRM Upscale	None	None	1) Automatic Initiation - Neutron Flux – high 2) Manual Initiation	N/A
	3. Reactor Vessel Steam Dome Pressure – High	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low, Level 3 2) Manual Initiation	N/A
	4. Reactor Vessel Water Level – Low, Level 3	15.2.7	Loss of Feedwater Flow	1) Automatic Initiation: - Main Steam Isolation Valve – Closure - OPRM Upscale 2) Manual scram	IMF-AOT
		15.6.5	Loss of Coolant Accidents	1) Automatic Initiation: - Primary Containment Pressure - High 2) Manual scram	DBA
		15.6.6	Feedwater Line Break	1) Automatic Initiation: - Main Steam Isolation Valve – Closure 2) Manual scram	DBA
	5. Main Steam Isolation Valve – Closure	15.2.4	Main Steam Isolation Valve (MSIV) Closure	1) Automatic Initiation: - Main Steam Isolation Valve – Closure - Reactor Vessel Steam Dome Pressure – High 2) Manual scram	IMF-AOT

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
		15.6.4	Steam System Piping Break Outside Containment	1) Manual scram	DBA
	6. Primary Containment Pressure – High	None	None	1) Automatic Initiation: - Reactor Vessel Water Level – Low, Level 3 2) Manual scram	N/A
	7. Scram Discharge Volume Water Level – High				
	7a. Transmitter/Level indicating Switch	None	None	1) Automatic Initiation - Transmitter/Level Switch 2) Manual SCRAM	N/A
	7b. Transmitter/Level Switch	None	None	1) Automatic Initiation - Transmitter/Level indicating Switch 2) Manual SCRAM	N/A
	8. Turbine Throttle Valve – Closure	15.1.3	Pressure Regulator Failure - Open	1) Automatic Initiation: - Main Steam Isolation Valve – Closure 2) Manual scram	IMF-AOT
		15.2.3	Turbine Trip	1) Automatic Initiation: - Main Steam Isolation Valve – Closure - Neutron Flux – high - Reactor Vessel Steam Dome Pressure – High 2) Manual scram	IMF-AOT

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
		15.2.5	Loss of Condenser Vacuum	1) Automatic Initiation: - Main Steam Isolation Valve – Closure - Neutron Flux – high - Reactor Vessel Steam Dome Pressure – High 2) Manual scram	IMF-AOT
		15.3.1	Recirculation Pump Trip	1) Automatic Initiation: - Main Steam Isolation Valve – Closure 2) Manual scram	IMF-AOT
		15.3.3	Recirculation Pump Seizure	1) Automatic Initiation: - Main Steam Isolation Valve – Closure 2) Manual scram	DBA
		15.3.4	Recirculation Pump Shaft Break	1) Automatic Initiation: - Main Steam Isolation Valve – Closure 2) Manual scram	DBA
	9. Turbine Governor Valve Fast Closure, Trip Oil Pressure – Low	15.1.2	Feedwater Controller Failure - Maximum Demand	1) Automatic Initiation:- Turbine Throttle Valve Closure 2) Manual scram	IMF-AOT
		15.2.2	Generator Load Rejection	1) Automatic Initiation: - Neutron Flux – high - Reactor Vessel Steam Dome Pressure – High 2) Manual scram	IMF-AOT
	10. Reactor Mode Switch – Shutdown Position	None	None	1) Manual SCRAM	N/A

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	11. Manual Scram	None	None	1) Reactor Mode Switch - Shutdown Position	N/A

2. Feedwater and Main Turbine High Water Level Trip Instrumentation – TS section 3.3.2.2

The Feedwater and Main Turbine High-Water Level Trip Function is comprised of three channels utilizing a two-out-of-three initiation logic scheme that will trip and isolate the two feedwater pump turbines and the main turbine.

The Feedwater and Main Turbine High-Water Level Trip design creates defense-in-depth from the redundancy of the channels for the Trip Function.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
3.3.2.2	Feedwater and Main Turbine High Water Level Trip Instrumentation	15.1.2	Feedwater controller Failure - Maximum Demand	1) Automatic Initiation: - Moisture Separator Level High Turbine Trip 2) Manual turbine Trip	IMF-AOT
		15.1.3	Pressure Regulator Failure - Open	1) Automatic Initiation: - Moisture Separator Level High Turbine Trip 2) Manual turbine Trip	IMF-AOT
		15.3.1	Recirculation Pump Trip	1) Automatic Initiation: - Moisture Separator Level High Turbine Trip 2) Manual turbine Trip	IMF-AOT
		15.3.3	Recirculation Pump Seizure	1) Automatic Initiation: - Moisture Separator Level High Turbine Trip 2) Manual turbine Trip	DBA
		15.3.4	Recirculation Pump Shaft Break	1) Automatic Initiation: - Moisture Separator Level High Turbine Trip 2) Manual turbine Trip	DBA

3. End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation – TS section 3.3.4.1

The EOC-RPT has two identical trip systems, either of which can actuate an RPT. Each EOC-RPT trip system is a two-out-of-two initiation logic for the Trip Function. If either trip system actuates, both recirculation pumps will trip.

The EOC-RPT design creates defense-in-depth from the redundancy of trip systems for the Trip Function.

Diverse EOC-RPT trip systems

- Turbine Throttle Valve (TTV) – Closure: 2 instrument channels arranged in a 2 out of 2 logic.
- Turbine Governor Valve (TGV) Fast closure, Trip Oil Pressure – Low: 2 instrument channels arranged in a 2 out of 2 logic.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
3.3.4.1	End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation				
	a.1. Turbine Throttle Valve (TTV) – Closure	15.2.2	Generator Load Reject	1) Automatic Initiation: - Turbine Governor Valve (TGV) Fast closure, Trip Oil Pressure – Low 2) Manual RPT	IMF-AOT
		15.2.3	Turbine Trip	1) Automatic Initiation: - Turbine Governor Valve (TGV) Fast closure, Trip Oil Pressure – Low 2) Manual RPT	IMF-AOT
		15.2.5	Loss of condenser Vacuum	1) Automatic Initiation: - Turbine Governor Valve (TGV) Fast closure, Trip Oil Pressure – Low 2) Manual RPT	IMF-AOT
		15.2.6	Loss of Alternating Current Power	1) Automatic Initiation: - Turbine Governor Valve (TGV) Fast closure, Trip Oil Pressure – Low 2) Manual RPT	IMF-AOT
	a.2. Turbine Governor Valve (TGV) Fast closure, Trip Oil Pressure – Low	15.2.2	Generator Load Reject	1) Automatic Initiation: - Turbine Throttle Valve (TTV) – Closure 2) Manual RPT	IMF-AOT
		15.2.3	Turbine Trip	1) Automatic Initiation: - Turbine Throttle Valve (TTV) – Closure 2) Manual RPT	IMF-AOT
		15.2.5	Loss of condenser Vacuum	1) Automatic Initiation: - Turbine Throttle Valve (TTV) – Closure 2) Manual RPT	IMF-AOT

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
		15.2.6	Loss of Alternating Current Power	1) Automatic Initiation: - Turbine Throttle Valve (TTV) – Closure 2) Manual RPT	IMF-AOT

4. Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation – TS section 3.3.4.2

The ATWS-RPT consists of two independent trip systems. One trip system trips one recirculation pump while the other trip system trips the other recirculation pump. Each trip system contains 2 channels for each function arranged in a 1 out of 2 taken twice logic.

The ATWS-RPT design creates defense-in-depth from the redundancy of trip systems for the Trip Function.

Diverse ATWS-RPT trip systems

- Reactor Vessel Water Level - Low Low, Level 2: 4 instrument channels, 2 channels per trip system..
- Reactor Vessel Steam Dome Pressure – High: 4 instrument channels, 2 channels per trip system.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation				
3.3.4.2	a. Reactor Vessel Water Level - Low Low, Level 2	15.8	Anticipated transients Without SCRAM	1) Automatic Initiation: - Reactor Vessel Steam Dome Pressure – High 2) Manual RPT	DBA
	b. Reactor Vessel Steam Dome Pressure – High	15.8	Anticipated transients Without SCRAM	1) Automatic Initiation: - Reactor Vessel Water Level - Low Low, Level 2 2) Manual RPT	DBA

5. Emergency Core Cooling System (ECCS) Instrumentation – TS section 3.3.5.1

The ECCS Instrumentation design creates defense-in-depth from the redundancy of the channels for each trip system performing the Trip Function (ECCS Actuation).

Diverse ECCS instrumentation inputs (TS Table 3.3.1.1-1)

1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems
    - 1a. Reactor Vessel Water Level – Low Low Low, Level 1 &
      1b. Drywell Pressure - High:
      Reactor vessel water level (trip level 1) is monitored by two redundant differential pressure switches. Drywell pressure is monitored by two redundant pressure switches. The switches are connected in a one-out-of-two taken twice logic.
    - 1c. LPCS Pump Start - LOCA Time Delay Relay: There are four LOCA time delay relays, one in each of the low pressure ECCS pump start logic circuits, arranged in a 1 out of 1 logic for each pump.
    - 1d. LPCI Pump A Start - LOCA Time Delay Relay: There are four LOCA time delay relays, one in each of the low pressure ECCS pump start logic circuits, arranged in a 1 out of 1 logic for each pump.
    - 1e. LPCI Pump A Start - LOCA/LOOP Time Delay Relay: There are two LOCA/LOOP time delay relays, one in each of the RHR “A” and RHR “B” pump start logic circuits, arranged in a 1 out of 1 logic for each pump.
    - 1f. Reactor Vessel Pressure – Low (Injection Permissive): There are four pressure switches that sense the reactor dome pressure, with one pressure switch for each low pressure ECCS injection valve, arranged in a 1 out of 1 logic for each injection valve.
    - 1g. LPCS Pump Discharge Flow - Low (Minimum Flow): One flow indicating switch arranged in a 1 out of 1 logic.
    - 1h. LPCI Pump A Discharge Flow - Low (Minimum Flow): One flow indicating switch arranged in a 1 out of 1 logic.
    - 1i. Manual Initiation: For each low pressure ECCS pump there is one switch and push button, with two channels per switch and push button, arranged in a 2 out of 2 logic.
2. LPCI B and LPCI C Subsystems
    - 2a. Reactor Vessel Water Level – Low Low Low, Level 1 &
      2b. Drywell Pressure – High:
      Reactor vessel water level (trip level 1) is monitored by two redundant differential pressure switches. Drywell pressure is monitored by two

redundant pressure switches. The switches are connected in a one-out-of-two taken twice logic.

- 2c. LPCI Pump B Start - LOCA Time Delay Relay: There are four LOCA time delay relays, one in each of the low pressure ECCS pump start logic circuits, arranged in a 1 out of 1 logic for each pump.
- 2d. LPCI Pump C Start - LOCA Time Delay Relay: There are four LOCA time delay relays, one in each of the low pressure ECCS pump start logic circuits, arranged in a 1 out of 1 logic for each pump.
- 2e. LPCI Pump B Start - LOCA/LOOP Time Delay Relay: There are two LOCA/LOOP time delay relays, one in each of the RHR “A” and RHR “B” pump start logic circuits, arranged in a 1 out of 1 logic for each pump.
- 2f. Reactor Vessel Pressure – Low (Injection Permissive): There are four pressure switches that sense the reactor dome pressure, with one pressure switch for each low pressure ECCS injection valve, arranged in a 1 out of 1 logic for each injection valve.
- 2g. LPCI Pumps B & C Discharge Flow - Low (Minimum Flow): One flow indicating switch per pump, arranged in a 1 out of 1 logic.
- 2h. Manual Initiation: For each low pressure ECCS pump there is one switch and push button, with two channels per switch and push button, arranged in a 2 out of 2 logic.

3. High Pressure Core Spray (HPCS) System
    - 3a. Reactor Vessel Water Level – Low Low, Level 2: 4 instrument channels arranged in a one-out-of-two taken twice logic.
    - 3b. Drywell Pressure – High: 4 instrument channels arranged in a one-out-of-two taken twice logic.
    - 3c. Reactor Vessel Water Level – High, Level 8: 2 instrument channels arranged in a 2 out of 2 logic.
    - 3d. Condensate Storage Tank Level – Low: 2 instrument channels arranged in a 1 out of 2 logic.
    - 3e. Suppression Pool Water Level – High: 2 instrument channels arranged in a 1 out of 2 logic.
    - 3f. HPCS System Flow Rate – Low (Minimum Flow): 1 instrument channel arranged in a 1 out of 1 logic.
    - 3g. Manual Initiation: One switch and push button, with two channels per switch and push button, arranged in a 2 out of 2 logic.

4&5. Automatic Depressurization System (ADS) Trip System “A” and “B”

- 4a. Reactor Vessel Water Level – Low Low Low, Level 1 &
  5a. Reactor Vessel Water Level – Low Low Low, Level 1:

2 independent trip systems A and B. 2 channels per trip system arranged in a 2 out of 2 logic.

- 4b. ADS Initiation Timer &
  5b. ADS Initiation Timer:
  2 channels with one in each trip system A and B arranged in a 1 out of 1 logic.
- 4c. Reactor Vessel Water Level – Low Level 3 (Permissive) &
  5c. Reactor Vessel Water Level – Low Level 3 (Permissive):
  2 channels with one in each trip system A and B arranged in a 1 out of 1 logic.
- 4d. LPCS Pump Discharge Pressure – High &
  4e. LPCI Pump A Discharge Pressure – High &
  5d. LPCI Pumps B & C Discharge Pressure – High:
  2 LPCS and 2 LPCI A channels input to ADS trip system A. 2 LPCI B and 2 LPC C channels input to ADS trip system B. In order to generate an ADS permissive I one trip system only one pump (both channels for the pump) indicate the high discharge pressure condition.
- 4f. Accumulator Backup Compressed Gas System Pressure – Low &
  5e. Accumulator Backup Compressed Gas System Pressure – Low:
  3 channels input into ADS trip system A arranged in a 2 out of 3 logic. 3 channels input into ADS trip system B arranged in a 2 out of 3 logic.
- 4g. Manual Initiation &
  5f. Manual Initiation
  Two switch and push buttons (with two channels per switch and push button) for ADS trip system A arranged in a 4 out of 4 logic.
  Two switch and push buttons (with two channels per switch and push button) for ADS trip system B arranged in a 4 out of 4 logic.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
3.3.5.1	1. Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems				
	1a. Reactor Vessel Water Level – Low Low Low, Level 1	15.6.5	Loss of Coolant Accident	1) Automatic Initiation: - LPCI A & LPCS Initiation Drywell Pressure - High - LPCI B & C Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Drywell Pressure - High - HPCS Initiation Drywell Pressure - High - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - RCIC Initiation Drywell Pressure - High - RCIC Initiation Low Low Level 2 2) Manual Initiation	DBA
	1b. Drywell Pressure - High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation: - LPCA & LPCS Reactor Vessel Water Level – Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Drywell Pressure - High - HPCS Initiation Drywell Pressure - High - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - RCIC Initiation Drywell Pressure - High - RCIC Initiation Low Low Level 2 2) Manual Initiation	DBA
	1c. LPCS Pump Start - LOCA Time Delay Relay	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCS)			

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	1d. LPCI Pump A Start - LOCA Time Delay Relay	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI A)			
	1e. LPCI Pump A Start - LOCA/LOOP Time Delay Relay	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI A)			
	1f. Reactor Vessel Pressure – Low (Injection Permissive)	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCS & A)			
	1g. LPCS Pump Discharge Flow - Low (Minimum Flow)	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCS)			
	1h. LPCI Pump A Discharge Flow - Low (Minimum Flow)	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI A)			
	1i. Manual Initiation	None	None	1) Automatic Initiation: - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - HPCS Initiation Drywell Pressure – High - RCIC Initiation Low Low Level 2 - RCIC Initiation Drywell Pressure - High - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - LPCI B & C Initiation Drywell Pressure - High	N/A
	2. LPCI B and LPCI C Subsystems				

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	2a. Reactor Vessel Water Level – Low Low Low, Level 1	15.6.5	Loss of Coolant Accident	1) Automatic Initiation: - LPCI B & LPCI C Initiation Drywell Pressure - High - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - HPCS Initiation Drywell Pressure - High - RCIC Initiation Low Low Level 2 - RCIC Initiation Drywell Pressure - High 2) Manual Initiation	DBA
	2b. Drywell Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation: - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - HPCS Initiation Drywell Pressure - High - RCIC Initiation Low Low Level 2 - RCIC Initiation Drywell Pressure - High 2) Manual Initiation	DBA
	2c. LPCI Pump B Start - LOCA Time Delay Relay	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI B)			
	2d. LPCI Pump C Start - LOCA Time Delay Relay	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI C)			

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	2e. LPCI Pump B Start - LOCA/LOOP Time Delay Relay	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI B)			
	2f. Reactor Vessel Pressure – Low (Injection Permissive)	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI B & C)			
	2g. LPCI Pumps B & C Discharge Flow - Low (Minimum Flow)	The Function is implicitly assumed in the accident and transient analyses (which take credit for LPCI B & C)			
	2h. Manual Initiation	None	None	1) Automatic Initiation: - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - HPCS Initiation Drywell Pressure – High - RCIC Initiation Low Low Level 2 - RCIC Initiation Drywell Pressure - High - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - LPCI B & C Initiation Drywell Pressure - High	N/A
	3. High Pressure Core Spray (HPCS) System				

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	3a. Reactor Vessel Water Level – Low Low, Level 2	15.1.2	Feedwater Controller Failure - Maximum Demand	1) Automatic Initiation: - RCIC Initiation Low Low Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	IMF-AOT
		15.1.3	Pressure Regulator Failure - Open	1) Automatic Initiation: - RCIC Initiation Low Low Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	IMF-AOT
		15.2.2	Pressure Regulator Failure - Closed	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	IMF-AOT
		15.2.3	Turbine Trip	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	IMF-AOT

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
		15.2.4	Main Steam Isolation Valve Closure	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	IMF-AOT
		15.2.7	Loss of Feedwater Flow	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	IMF-AOT
		15.3.4	Recirculation Pump Shaft Break	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	DBA
		15.6.4	Steam system Piping Break Outside Containment	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	DBA

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
		15.6.5	Loss of Coolant Accident	1) Automatic Initiation: - HPCS Initiation Drywell Pressure - High - RCIC Initiation Low Low, Level 2 - RCIC Initiation Drywell Pressure - High - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	DBA
		15.6.6	Feedwater Line Break - Outside Containment	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	DBA
		15.8.2	Loss of Feedwater ATWS	1) Automatic Initiation: - RCIC Initiation Low Low, Level 2 - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Initiation	DBA

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	3b. Drywell Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation: - HPCS initiation Reactor Vessel Water Level – Low Low, Level 2 - RCIC Initiation Low Low, Level 2 - RCIC Initiation Drywell Pressure - High - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - LPCI B & C Initiation Drywell Pressure - High 2) Manual Initiation	DBA
	3c. Reactor Vessel Water Level – High, Level 8	None	None	1) Manual Trip	None
	3d. Condensate Storage Tank Level – Low	The Function is implicitly assumed in the accident and transient analyses (which take credit for HPCS)			
	3e. Suppression Pool Water Level – High	The Function is implicitly assumed in the accident and transient analyses (which take credit for HPCS)			
	3f. HPCS System Flow Rate – Low (Minimum Flow)	The Function is implicitly assumed in the accident and transient analyses (which take credit for HPCS)			

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	3g. Manual Initiation	None	None	1) Automatic Initiation: - HPCS Initiation Reactor Vessel Water Level – Low Low, Level 2 - HPCS Initiation Drywell Pressure – High - RCIC Initiation Low Low Level 2 - RCIC Initiation Drywell Pressure - High - LPCI A & LPCS Initiation Reactor Vessel Water Level - Low Low Low, Level 1 - LPCI A & LPCS Initiation Drywell Pressure - High - LPCI B & C Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - LPCI B & C Initiation Drywell Pressure - High	N/A
	4. Automatic Depressurization System (ADS) Trip System A				
	4a. Reactor Vessel Water Level – Low Low Low, Level 1	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - ADS B Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual ADS Initiation	DBA
	4b. ADS Initiation Timer	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - ADS B Trip System 2) Manual ADS Initiation	DBA
	4c. Reactor Vessel Water Level – Low Level 3 (Permissive)	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - ADS B Trip System 2) Manual ADS Initiation	DBA
	4d. LPCS Pump Discharge Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - LPCI Pump A Discharge Pressure – High - ADS B Trip System 2) Manual ADS Initiation	DBA

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	4e. LPCI Pump A Discharge Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - LPCS Pump Discharge Pressure – High - ADS B Trip System 2) Manual ADS Initiation	DBA
	4f. Accumulator Backup Compressed Gas System Pressure – Low	15.6.5	Loss of Coolant Accident	1) Back up Accumulator	DBA
	4g. Manual Initiation	None	None	1) Automatic Initiation - ADS A Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - ADS B Initiation Reactor Vessel Water Level – Low Low Low, Level 1	N/A
	5. ADS Trip System B				
	5a. Reactor Vessel Water Level – Low Low Low, Level 1	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - ADS A Initiation Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual ADS Initiation	DBA
	5b. ADS Initiation Timer	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - ADS A Trip System 2) Manual ADS Initiation	DBA
	5c. Reactor Vessel Water Level – Low Level 3 (Permissive)	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - ADS A Trip System 2) Manual ADS Initiation	DBA

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	5d. LPCI Pumps B & C Discharge Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - LPCI Pump B Discharge Pressure – High - LPCI Pump C Discharge Pressure – High - ADS A Trip System 2) Manual ADS Initiation	DBA
	5e. Accumulator Backup Compressed Gas System Pressure – Low	15.6.5	Loss of Coolant Accident	1) Back up Accumulator	DBA
	5f. Manual Initiation	None	None	1) Automatic Initiation - ADS A Initiation Reactor Vessel Water Level – Low Low Low, Level 1 - ADS B Initiation Reactor Vessel Water Level – Low Low Low, Level 1	N/A

6. Reactor Core Isolation Cooling (RCIC) System Instrumentation – TS section 3.3.5.3

The RCIC System Instrumentation design creates defense-in-depth from the redundancy of the channels for each trip system.

Diverse RCIC system instrumentation inputs (TS Table 3.3.5.3-1)

- 1. Reactor Vessel Water Level – Low Low, Level 2: 4 instrument channels arranged in a 1 of 2 taken twice logic.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
3.3.5.3	1. Reactor Vessel Water Level – Low Low, Level 2	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low Low, Level 2 2) Manual Initiation	N/A

7. Primary Containment Isolation Instrumentation – TS section 3.3.6.1

The primary containment isolation instrumentation design creates defense-in-depth from the redundancy of the channels for each trip system.

Diverse primary containment isolation inputs (TS Table 3.3.6.1-1)

- 1. Main steam Line Isolation
    - 1a. Reactor Vessel Water Level – Low Low Low, Level 1 &
      1b. Main Steam Line Pressure – Low &
      1d. Condenser Vacuum – Low &
      1e. Main Steam Tunnel temperature – high &
      1f. Main Steam Tunnel Differential Temperature – High:
      4 channels arranged in a 1 out of 2 taken twice logic to isolate the MSIVs.
      4 channels arranged in two 2 out of 2 trip systems to isolate all MSIV drain lines. One 2 out of 2 trip system is associated with the inboard valves and the other 2 out of 2 trip system is associated with the outboard valves.
    - 1c. Main Steam Line Flow – high: 16 channels, 4 channels for each steam line arranged in a 1 out of 8 taken twice logic to initiate isolation of the MSIVs.
    - 1g. Manual Initiation: 8 channels, 2 per each switch and push button. The four channels from two switch and push buttons input into one trip system and the four channels from the other two switch and push buttons input into the other trip system.
      To close all MSIVs, both trip systems must actuate. The logic of each trip system is arranged such that both channels from one of the associated switch and push buttons are required to actuate the trip system (i.e., the switch and push button must be both armed and depressed for the trip system to actuate).
      To close the MSL drain valves, all channels in both trip systems must actuate (i.e., both channels from each of the two associated switch and push buttons are required to actuate the inboard valve trip system and both channels from each of the two associated switch and push buttons are required to actuate the outboard valve trip system).
- 2. Primary Containment Isolation
    - 2a. Reactor Vessel Water Level – Low, Level 3: 4 channels arranged in a 2 out of 2 logic per trip system. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve. Isolates

group 5 valves. The Group 5 PCIVs need only one trip system (the inboard valve system) to isolate all Group 5 valves.

    - 2b. Reactor Vessel Water Level – Low Low, Level 2: 4 channels arranged in a 2 out of 2 logic per trip system. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve. Isolates group 2, 3, 4, and 7 valves.
    - 2c. Drywell Pressure – High: 4 channels arranged in a 2 out of 2 logic per trip system. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve. Isolates group 3, 4, and 5 valves.
    - 2d. Reactor Building Vent Exhaust Plenum Radiation – High: 4 channels arranged in a 2 out of 2 logic per trip system. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve. Isolates group 3 valves.
    - 2e. Manual Initiation: For the group 3 valves and some Group 4 valves (RCC-V-5, RCC-V-21, RCC-V-40, RCC-V-104, FPC-V-149, FPC-V-153, FPC-V-154, FPC-V-156, PI-VX-250, PI-VX-251, PI-VX-253, PI-VX-256, PI-VX-257, PI-VX-259, TIP-V-1, TIP-V-2, TIP-V-3, TIP-V-4, AND TIP-V-15) there are 4 switch and push buttons with 2 channels per switch and push button, with 2 switch and push buttons per trip system. The logic is arranged in a 4 out of 4 channels per trip system. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve. For the group 2, remaining group 4 (FDR-V-3, FDR-V-4, EDR-V-19, EDR-V-20), and group 5 valves there are 2 switch and push buttons with 2 channels per switch and push button, with 1 switch and push buttons per trip system. The logic is arranged in a 2 out of 2 channels per trip system. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.

- 3. Reactor Core Isolation Cooling (RCIC) System Isolation
    - 3a. RCIC Steam Line Flow – High &
      3b. RCIC Steam Line Flow – Time Delay &
      3e. RCIC Equipment Room Area Temperature – High &
      3f. RCIC Equipment Room Area Differential Temperature – High &
      3g. Reactor Water Cleanup (RWCU) System /RCIC steam Line Routing Area Temperature – High:
      2 channels, 1 per trip system, arranged in a 1 out of 1 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
    - 3c. RCIC Steam Supply Pressure – Low &

    3d. RCIC Turbine Exhaust Diaphragm Pressure – High:
    4 channels, 2 per trip system, arranged in a 2 out of 2 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
  - 3h. Manual Initiation: 1 channel which isolates the outboard RCIC valve only.
- 4. RWCU System Isolation
  - 4a. Differential Flow – High &
    4b. Differential Flow – Time Delay &
    4c. Blowdown Flow – High &
    4d. Heat Exchanger Room Area Temperature – High &
    4e. Heat Exchanged Room Area Ventilation Differential Temperature – High &
    4h. RWCU/RCIC Line Routing Area Temperature – High:
    2 channels, 1 channel in each trip system, arranged in 1 out of 1 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
  - 4f. Pump Room Area – Temperature High &
    4g. Pump Room Area Ventilation Differential Temperature – High:
    4 channels, 1 channel in each trip system in each room arranged in a 1 out of 1 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
  - 4i. RWCU Line Routing Area Temperature – High: 8 channels, 1 channel in each trip system in each room arranged in a 1 out of 1 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
  - 4j. Reactor Vessel Water Level – Low Low, Level 2: 4 channels, 2 channels per trip system arranged in a 2 out of 2 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
  - 4k. Standby Liquid Control (SLC) System Initiation: 2 channels arranged in a 1 out of 2 logic closing only the outboard valve.
  - 4l. Manual Initiation: 4 channels, 2 per each switch and push button, arranged in a 2 out of 2 logic for each switch and push button. One of the switch and push buttons is connected to the inboard valve and the other is connected to the outboard valve.
- 5. Residual Heat Removal (RHR) Shutdown Cooling (SDC) System Isolation

  - 5e. Reactor Vessel Pressure – High: 2 channels, 1 channel in each trip system, arranged in 1 out of 1 logic. One of the trip systems is connected to the inboard valve and the other is connected to the outboard valve.
  - 5f. Manual Initiation: 4 channels, 2 per each switch and push button, arranged in a 2 out of 2 logic for each switch and push button. One of the switch and push buttons is connected to the inboard valve and the other is connected to the outboard valve.
- 6. Traversing Incore Probe Isolation
  - 6a. Reactor Vessel Water Level – Low Low, Level 2 &
6b. Drywell Pressure – High:
4 channels, 2 Reactor Vessel Water Level – Low Low, Level 2 channels and 2 Drywell Pressure – High channels, arranged in a 1 out of 2 taken twice logic.

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
3.3.6.1	1. Main steam Line Isolation				
	1a. Reactor Vessel Water Level – Low Low Low, Level 1	15.2.7	Loss of Feedwater Flow	1) Automatic Initiation - Main Steam Line Pressure – Low 2) Manual Isolation	IMF-AOT
		15.6.5	Loss of Coolant Accident	1) Automatic Initiation - Main Steam Line Pressure – Low 2) Manual Isolation	DBA
		15.6.6	Feedwater Line Break	1) Automatic Initiation - Main Steam Line Pressure – Low 2) Manual Isolation	DBA
	1b. Main Steam Line Pressure – Low	15.1.3	Pressure Regulator Failure - Open	1) Automatic Initiation - Reactor Vessel Water Level – Low Low Low, Level 1 2) Manual Isolation	IMF-AOT
	1c. Main Steam Line Flow – high	15.6.4	Steam System Piping Break Outside Containment	1) Automatic Initiation - Main Steam Tunnel temperature – high - Main Steam Tunnel Differential Temperature – High 2) Manual Isolation	DBA
	1d. Condenser Vacuum – Low	15.2.5	Loss of condenser Vacuum	1) Manual Isolation	IMF-AOT

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	1e. Main Steam Tunnel temperature – high	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low Low Low, Level 1 - Main Steam Line Pressure – Low - Main Steam Tunnel temperature – high - Condenser Vacuum – Low - Main Steam Tunnel Differential Temperature – High 2) Manual Isolation	N/A
	1f. Main Steam Tunnel Differential Temperature – High	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low Low Low, Level 1 - Main Steam Line Pressure – Low - Main Steam Tunnel temperature – high - Condenser Vacuum – Low - Main Steam Tunnel temperature – high 2) Manual Isolation	N/A
	1g. Manual Initiation	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low Low Low, Level 1 - Main Steam Line Pressure – Low - Main Steam Tunnel temperature – high - Condenser Vacuum – Low - Main Steam Tunnel Differential Temperature – High - Main Steam Tunnel temperature – high 2) Manual Isolation	N/A
	2. Primary Containment Isolation				

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	2a. Reactor Vessel Water Level – Low, Level 3	15.6.5	Loss of Coolant Accidents	1) Automatic Initiation - Reactor Vessel Water Level – Low Low, Level 2 - Drywell Pressure – High 2) Manual Isolation	DBA
	2b. Reactor Vessel Water Level – Low Low, Level 2	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - Reactor Vessel Water Level – Low, Level 3 - Drywell Pressure – High 2) Manual Isolation	DBA
	2c. Drywell Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - Reactor Vessel Water Level – Low Low, Level 2 - Reactor Vessel Water Level – Low, Level 3 2) Manual Isolation	DBA
	2d. Reactor Building Vent Exhaust Plenum Radiation – High	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low, Level 3 - Reactor Vessel Water Level – Low Low, Level 2 - Drywell Pressure – High 2) Manual Isolation	N/A
	2e. Manual Initiation	None	None	1) Automatic Initiation - Reactor Vessel Water Level – Low, Level 3 - Reactor Vessel Water Level – Low Low, Level 2 - Drywell Pressure – High - Reactor Building Vent Exhaust Plenum Radiation – High	N/A
	3. Reactor Core Isolation Cooling (RCIC) System Isolation				

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	3a. RCIC Steam Line Flow – High	These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks.		1) Automatic Initiation - RCIC Steam Line Flow – High & RCIC Steam Line Flow – Time Delay - RCIC Steam Supply Pressure – Low - RCIC Equipment Room Area Temperature – High - RCIC Equipment Room Area Differential Temperature – High - Reactor Water Cleanup (RWCU) System /RCIC steam Line Routing Area Temperature – High 2) Manual Isolation	N/A
	3b. RCIC Steam Line Flow – Time Delay				N/A
	3c. RCIC Steam Supply Pressure – Low	This isolation is for equipment protection and is not assumed in any transient or accident analysis in the FSAR		1) Automatic Initiation - RCIC Steam Supply Pressure – Low - RCIC Turbine Exhaust Diaphragm Pressure – High 2) Manual Isolation	N/A
	3d. RCIC Turbine Exhaust Diaphragm Pressure – High				N/A
	3e. RCIC Equipment Room Area Temperature – High	These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as recirculation or MSL breaks.		1) Automatic Initiation - RCIC Steam Line Flow – High & RCIC Steam Line Flow – Time Delay - RCIC Steam Supply Pressure – Low - RCIC Equipment Room Area Temperature – High - RCIC Equipment Room Area Differential Temperature – High	N/A
	3f. RCIC Equipment Room Area Differential Temperature – High				N/A

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	3g. Reactor Water Cleanup (RWCU) System /RCIC steam Line Routing Area Temperature – High			- Reactor Water Cleanup (RWCU) System /RCIC steam Line Routing Area Temperature – High 2) Manual Isolation	N/A
	3h. Manual Initiation	None	None	1) Automatic Initiation - RCIC Steam Line Flow – High & RCIC Steam Line Flow – Time Delay - RCIC Steam Supply Pressure – Low - RCIC Turbine Exhaust Diaphragm Pressure – High - RCIC Equipment Room Area Temperature – High - RCIC Equipment Room Area Differential Temperature – High - Reactor Water Cleanup (RWCU) System /RCIC steam Line Routing Area Temperature – High	N/A
	4. RWCU System Isolation				
	4a. Differential Flow – High	These Functions are not assumed in any FSAR transient or accident analysis, since bounding analyses are performed for large breaks such as MSLBs.		1) Automatic Initiation - Differential Flow – High & Differential Flow – Time Delay - Blowdown Flow – High 2) Manual Isolation	N/A
	4b. Differential Flow – Time Delay				
	4c. Blowdown Flow – High				

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	4d. Heat Exchanger Room Area Temperature – High	Credit for these instruments is not taken in any transient or accident analysis in the FSAR, since bounding analyses are performed for large breaks such as MSLBs.		1) Automatic Initiation - Heat Exchanger Room Area Temperature – High- - Heat Exchanged Room Area Ventilation Differential Temperature – High - Pump Room Area – Temperature High - Pump Room Area Ventilation Differential Temperature – High - RWCU/RCIC Line Routing Area Temperature – High - RWCU Line Routing Area Temperature – High 2) Manual Isolation	N/A
	4e. Heat Exchanged Room Area Ventilation Differential Temperature – High				
	4f. Pump Room Area – Temperature High				
	4g. Pump Room Area Ventilation Differential Temperature – High				
	4h. RWCU/RCIC Line Routing Area Temperature – High				
	4i. RWCU Line Routing Area Temperature – High				

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	4j. Reactor Vessel Water Level – Low Low, Level 2	The Reactor Vessel Water Level - Low Low, Level 2 Function associated with RWCU isolation is not directly assumed in any transient or accident analysis, since bounding analyses are performed for large breaks such as MSLBs.		1) Manual Isolation	N/A
	4k. Standby Liquid Control (SLC) System Initiation	15.8	Anticipated transients Without SCRAM	1) Manual Isolation	DBA

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	4l. Manual Initiation	None	None	1) Automatic Initiation - Differential Flow – High & Differential Flow – Time Delay - Blowdown Flow – High - Heat Exchanger Room Area Temperature – High- - Heat Exchanged Room Area Ventilation Differential Temperature – High - Pump Room Area – Temperature High - Pump Room Area Ventilation Differential Temperature – High - RWCU/RCIC Line Routing Area Temperature – High - RWCU Line Routing Area Temperature – High - Reactor Vessel Water Level – Low Low, Level 2 - Standby Liquid Control (SLC) System Initiation	N/A
	5. Residual Heat Removal (RHR) Shutdown Cooling (SDC) System Isolation				
	5e. Reactor Vessel Pressure – High	This interlock is provided only for equipment protection to prevent an intersystem LOCA scenario and credit for the interlock is not assumed in the accident or transient analysis in the FSAR.		1) Manual Isolation	N/A

TS/TS Table	Function	FSAR Section	Transient Accident	Diverse Instrumentation	Event
	5f. Manual Initiation	None	None	1) Automatic Initiation - Pump Room Area Temperature – High - Pump Room Area Ventilation Differential Temperature – High - Heat Exchanger Area Temperature – High - Reactor Vessel Water Level – Low, Level 3 - Reactor Vessel Pressure – High	N/A
	6. Traversing Incore Probe Isolation				
	6a. Reactor Vessel Water Level – Low Low, Level 2	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - Drywell Pressure – High 2) Manual Isolation	DBA
	6b. Drywell Pressure – High	15.6.5	Loss of Coolant Accident	1) Automatic Initiation - Reactor Vessel Water Level – Low Low, Level 2 2) Manual Isolation	DBA

8. Loss of Power (LOP) Instrumentation – TS section 3.3.8.1

The loss of power (LOP) instrumentation design creates defense-in-depth from separate Loss of Voltage or Degraded Voltage Initiation Functions.

Each 4.16kV ESF switchgear bus has its own Loss of Power (LOP) instrumentation that provides undervoltage initiation logic to actuate delayed source transfer from TR-S to TR-B (when TR-B is available) or TRS to associated Emergency Diesel Generator (EDG) (when TR-B is not available) for the Division 1 and Division 2 - 4.16kV Emergency Bus Undervoltage functions. Similarly the Division 3 – 4.16kV Emergency Bus has separate LOP instrumentation that provides undervoltage initiation logic to perform a delayed source transfer from TR-S to the associated EDG (since the Division 3 – 4.16kV Emergency bus does not have a backup offsite power circuit to TR-B). The voltage for Division 1, 2, and 3 - 4.16kV buses is monitored at two levels which can be considered as two different Loss of Power functions: Loss of Voltage and Degraded Voltage for each emergency bus.

Accident analyses (FSAR 15.6.5) credit the loading of two of the three EDGs based upon the Loss of Power (LOP) coincident with a LOCA. Consequently, three sets of Division 1, 2 and 3 – 4.16kV Emergency Bus power are available with two required channels per division (for each LOP instrumentation initiation function, namely Loss of Voltage or Degraded Voltage) when the associated EDG is required to be operable.

Regulatory Guide 1.174 Revision 2 Section 2.1.1 Defense-in-Depth

In accordance with the principles contained within Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 2, defense-in-depth consist of several elements and consistency with the defense-in-depth philosophy is maintained if the following occurs:

- A reasonable balance is preserved among prevention of core damage, prevention of containment failure, and consequence mitigation.
    - The CGS TS reflect this balance by allowing one channel to be placed in trip, while preserving the fundamental safety function of the applicable system. Tripping an inoperable channel does not affect the number of channels required to provide the safety function.

- Over-reliance on programmatic activities as compensatory measures associated with the change in the licensing basis is avoided.
    - No programmatic activities are relied upon as compensatory measures when one or two channels of the applicable instrumentation are inoperable. The remaining operable channels for that function are fully capable of performing the safety function of the applicable system.

- System redundancy, independence, and diversity are preserved commensurate with the expected frequency, consequences of challenges to the system, and uncertainties (e.g., no risk outliers)
    - System redundancy, independence, and diversity remain the same as in the as designed condition. The number of operable functions has not been decreased, the number of minimum operable channels to perform the safety function has not been decreased, and the channels remain independent as originally designed, even with one channel inoperable.

- Defense against potential common-cause failures are preserved, and the potential for the introduction of new common-cause failure mechanisms is assessed.
    - This LAR does not impact the original determination of common-cause failure for the applicable instrumentation and its functions. It may allow the CTs to be extended for one or two channels in a function to be inoperable prior to placing the channel in trip. Placing the channel in trip fulfils the channel’s trip function to perform the safety function of the applicable system.

- Independence of barriers is not degraded.
    - Barriers are not affected by this LAR request.

- Defense against human errors are preserved.
    - In the conditions listed in the TS, a potential extension of the TS CTs does not change any personnel actions required when the TS Action is entered. Therefore, no change to the possibility of a human error is introduced and no change to the defenses against potential human error have been made.

- The intent of the plant's design criteria is maintained.
    - The design criteria of the applicable systems are maintained as reflected in the FSAR. Redundancy, diversity of signal, and independence of trip/actuation channel functions are maintained with the requested change. The change requested in the LAR does not physically change the applicable systems in any way. It only allows additional time, under certain low risk conditions in accordance with the RICT Program, to perform actions that the NRC has previously determined to be acceptable.

Therefore, the defense-in-depth principals prescribed in Regulatory Guide 1.174, Revision 3 are met.

ENCLOSURE 1

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion
Times – RITSTF Initiative 4b"

LIST OF REVISED REQUIRED ACTIONS TO

CORRESPONDING PRA FUNCTIONS

List of Revised Required Actions to Corresponding PRA Functions

1.0 INTRODUCTION

Section 4.0, “Limitations and Conditions”, Item 2 of the NRC Final Safety Evaluation (Reference 1) for Nuclear Energy Institute (NEI) Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0 (Reference 2), identifies the following needed content:

- The license amendment request (LAR) will provide identification of the TS Limiting Conditions for Operation (LCOs) and action requirements to which the RMTS will apply.
- The LAR will provide a comparison of the TS functions to the PRA modeled functions of the structures, systems, and components (SSCs) subject to those LCO actions.
- The comparison should justify that the scope of the PRA model, including applicable success criteria such as number of SSCs required, flow rate, etc., are consistent with licensing basis assumptions (i.e., 50.46 [Emergency Core Cooling System (ECCS)] flowrates) for each of the TS requirements, or an appropriate disposition or programmatic restriction will be provided.

This enclosure provides confirmation that the Columbia Generating Station (CGS) PRA models include the necessary scope of SSCs and their functions to address each proposed application of the Risk-Informed Completion Time (RICT) Program to the proposed scope TS LCO Conditions, and provides the information requested for Section 4.0, Item 2 of the NRC Final Safety Evaluation. The scope of the comparison includes each of the TS LCO conditions and associated required actions within the scope of the RICT Program.

Table E1-1 below lists each TS LCO Condition to which the RICT Program is proposed to be applied and documents the following information regarding the TSs with the associated safety analyses, the analogous PRA functions and the results of the comparison:

- Column “Tech Spec Description”: Lists all of the LCOs and condition statements within the scope of the RICT Program.
- Column “SSCs Covered by TS LCO Condition and Applicable Mode(s)”: List the SSCs addressed by each action requirement. Note that SSCs not applicable to the CGS RICT Program are not listed.
- Column “Modeled in PRA?”: Indicates whether the SSCs addressed by the TS LCO Condition are included in the PRA.

- Column “Function Covered by TS LCO Condition”: Lists a summary of the required functions from the design basis analyses.

- Column “Design Success Criteria”: Provides a summary of the success criteria from the design basis analyses.

- Column “PRA Success Criteria”: List the function success criteria modeled in the PRA.

- Column “Comments”: Provides the justification or resolution to address any inconsistencies between the TS and PRA functions regarding the scope of SSCs and the success criteria. Where the PRA scope of SSCs is not consistent with the TS, additional information is provided to describe how the LCO condition can be evaluated using appropriate surrogate events. Differences in the success criteria for TS functions are addressed to demonstrate the PRA criteria provide a realistic estimate of the risk of the TS condition as required by NEI 06-09-A, Revision 0.

The corresponding SSCs for each TS LCO and the associated TS functions are identified and compared to the PRA. This description also includes the design success criteria and the applicable PRA success criteria. Any differences between the scope or success criteria are described in the table. Scope differences are justified by identifying appropriate surrogate events which permit a risk evaluation to be completed using the Configuration Risk Management Program tool for the RICT Program. Differences in success criteria typically arise due to the requirement in the American Society of Mechanical Engineers (ASME) / American Nuclear Society (ANS) RA-Sa-2009 PRA Standard (hereafter “ASME/ANS PRA Standard”) (Reference 3) to make PRAs realistic rather than bounding, whereas design basis criteria are necessarily conservative and bounding. The use of realistic success criteria is necessary to conform to capability Category II of the ASME/ANS PRA standard as required by NEI 06-09-A, Revision 0.

Examples of calculated RICT are provided in Table E1-2 for each individual condition to which the RICT applies (assuming no other SSCs modeled in the PRA are unavailable). These example calculations demonstrate the scope of the SSCs covered by TSs modeled in the PRA. Note that the more limiting of the core damage frequency (CDF) and large early release frequency (LERF) RICT result is shown.

Following implementation of the RICT Program, the actual RICT values will be calculated using the actual plant configuration and the current revision of the PRA model representing the as-built, as-operated condition of the plant, as required by NEI 06-09-A and the NRC Final Safety Evaluation. The actual RICT values may differ from the RICTs presented in this enclosure.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.1.7.A	One SLC subsystem inoperable.	Two SLC subsystems	Yes	Provide a backup capability for bringing the reactor from full power to a cold, xenon free shutdown	One of two SLC subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
3.3.1.1.A	Reactor Protection System (RPS) instrumentation - one or more required channels inoperable	**1. Intermediate Range Monitors (IRM)**					
		1a. Neutron Flux – High (Eight channels, two IRM channels per RPS logic subsystem)	No	Reactor Trip Initiation (SCRAM)	One Neutron Flux – High High channel in each RPS trip system	None	See Note 1
		1b. Inop (Eight channels, two IRM channels per RPS logic subsystem)	No	SCRAM	One Inop. channel in each RPS trip system	None	See Note 1
		2. Average Power Range Monitors (APRM)					
		2a. Neutron Flux - High (Setdown) (Four channels)	No	SCRAM	Two Neutron Flux – High (Setdown) channels	None	See Note 1
		2b. Simulated Thermal Power – High (Four channels)	No	SCRAM	Two Simulated Thermal Power – High channels	None	See Note 1
		2c. Neutron Flux – high (Four channels)	No	SCRAM	Two Neutron Flux – High channels	None	See Note 1
		2d. Inop (Four channels)	No	SCRAM	Two Inop channels	None	See Note 1
		2e. 2-Out-of-4 Voter (Four channels)	No	SCRAM	One 2-Out-Of-4 Voter channel in each RPS trip system	None	See Note 1

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.1.1.A (cont.)		2f. Oscillation Power Range Monitor (OPRM) Upscale (Four channels)	No	SCRAM	Two Oscillation Power Range Monitor Upscale channels	None	See Note 1
		3. Reactor Vessel Steam Dome Pressure – High (Four channels)	No	SCRAM	One Reactor Vessel Steam Dome Pressure – High channel in each RPS trip system	None	See Note 1
		4. Reactor Vessel Water Level – Low, Level 3 (Four channels)	No	SCRAM	One Reactor Vessel Water Level – Low channel in each RPS trip system	None	See Note 1
		5. Main Steam Isolation Valve (MSIV) – Closure (Sixteen channels, two per MSIV, one from each trip system)	No	SCRAM	Four MSIV – Closure channels, two in each trip system in three of four steam lines	None	See Note 1
		6. Primary Containment Pressure – High (Four channels)	No	SCRAM	One Primary Containment Pressure – High channel in each of two trip systems	None	See Note 1
		7. Scram Discharge Volume Water Level – High					
		7a. Transmitter/Level Indicating Switch (Four channels)	No	SCRAM	One Transmitter/ Level Indicating Switch – High channel in each RPS trip system	None	See Note 1
		7b. Transmitter/Level Switch (Four channels)	No	SCRAM	One Transmitter/ Level switch – High channel in each RPS trip system	None	See Note 1

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.1.1.A (cont.)		8. Turbine Throttle Valve (TTV)– Closure (Eight channels, two TTV channels per RPS logic subsystem)	No	SCRAM	Four TTV – Closure channels, two in each trip system in three of four TTVs	None	See Note 1
		9. Turbine Governor Valve (TGV) Fast Closure, Trip Oil Pressure – Low (Four channels)	No	SCRAM	One TGV Fast Closure Trip Oil Pressure – Low channel in each RPS trip system	None	See Note 1
		10. Reactor Mode Switch – Shutdown Position (Four channels)	No	SCRAM	One Reactor Mode Switch- Shutdown Position channel in each RPS trip system	None	See Note 1
		11. Manual Scram (Four channels)	No	SCRAM	One Manual Scram channel in each RPS trip system	None	See Note 1
3.3.1.1.B	------NOTE------ Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f -------------------- One or more Functions with one or more required channels inoperable in both trip systems.	See 3.3.1.1.A above, with the exception of the following functions excluded by the Condition NOTE: Average Power Range Monitors • Function 2.a, Neutron Flux – High, (Setdown) • Function 2.b, Simulated Thermal Power – High • Function 2.c, Neutron Flux – High • Function 2.d, Inop. • Function 2.f, OPRM Upscale					See Note 1
3.3.2.2.A	One feedwater pump and main turbine high water level trip channels inoperable.	Reactor Vessel Water Level (RVWL) – High (Three channels)	No	Trip of Feedwater Pumps and Main Turbine	Two RVWL - High channels out-of-three channels	None	See Note 2

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.4.1.A	End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation - One or more required channels inoperable.	Function a.1 Turbine Throttle Valve (TTV) – Closure (Four channels)	No	Trip Both Recirculation Pumps	Two Turbine Trip Valve Closure channels in either trip system OR Two Turbine Governor Valve Fast Closure Trip Oil Pressure-Low channels in either trip system	None	See Note 3
		Function a.2. Turbine Governor Valve (TGV) – Fast Closure, Trip Oil Pressure - Low (Four channels)					
3.3.4.2.A	Anticipated Transient Without SCRAM Recirculation Pump Trip (ATWS-RPT) Instrumentation - one or more channels inoperable	Function a. RVWL – Low Low Level 2 (Four channels) (See Note 4)	Yes	Trips Recirculation Pump associated with the trip system	Two RVWL – Low, Low, Level 2 channels in one of two trip systems OR Two RVSD Pressure – High channels in one of two trip systems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		Function b. Reactor Vessel Steam Dome (RVSD) Pressure – High (Four channels) (See Note 4)					

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.B	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	**1. ECCS Actuation Instrumentation for Low Pressure Coolant Injection-A (LPCI) and Low Pressure Core Spray (LPCS) Subsystems**					
		1.a. RVWL – Low Low Low, Level 1 (Two channels)	Yes	Actuate both LPCI A and LPCS	One RVWL Level 1 channel <u>OR</u> One Drywell Pressure - High channel from Two Subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		1.b. Drywell Pressure – High (Two channels)	Yes	Actuate both LPCI A and LPCS			
		2. ECCS Actuation Instrumentation for LPCI B and LPCI C Subsystems					
		2.a. RVWL – Low Low Low, Level 1 (Two channels)	Yes	Actuate both LPCI B and LPCI C	One RVWL – Level 1 channel <u>OR</u> One Drywell Pressure - High channel from Two Subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		2.b. Drywell Pressure – High (Two channels)	Yes	Actuate both LPCI B and LPCI C			
		3. ECCS Actuation Instrumentation High Pressure Core Spray (HPCS) System					
		3.a. Reactor Vessel Water Level – Low Low, Level 2 (RVWL2) (Four channels)	Yes	Actuate HPCS	Two RVWL Level 2 differential pressure switches	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		3.b. Drywell Pressure – High (Four channels)	Yes	Actuate HPCS	Two Drywell Pressure - High pressure switches	Same as Design Success Criteria	

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.C	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	**1. ECCS Actuation Instrumentation for LPCI A and LPCS Subsystems**					
		1.c. LPCS Pump Start - LOCA Time Delay (TD) Relay (one relay)	No	Actuate LPCS system	One LPCS Pump Start LOCA TD Relay	None	The input actuation relays are modeled and will be used as equivalent surrogates. These are equivalent because they fail the individual pump start function, same as the TD Relays.
		1.d. LPCI A Pump Start LOCA TD Relay (one relay)	No	Actuate LPCI A system division	One LPCI A Pump Start LOCA TD Relay	None	
		1.e. LPCI A Pump Start LOCA/LOOP TD Relay (one relay)	Yes	Actuate LPCI A system division	One LPCI A Pump Start LOCA/LOOP TD Relay	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program
		1.f. Reactor Vessel Pressure (RVP) - Low (Injection permissive) (Two pressure channels per division)	Yes	Permit LPCS or LPCI Injection	One RVP – Low pressure channel per ECCS pump discharge valve	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program
		1.i. Manual Initiation (Two channels – one switch/pushbutton (PB) pair per division)	Yes	Manually actuate ECCS pumps	Both channels of a switch/PB pair for division	Single switch data boundary used.	The use of a single basic event for a dual channel switch/PB pair is equivalent.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.C (cont.)		**2. ECCS Actuation Instrumentation for LPCI B and LPCI C Subsystems**					
		2.c. LPCI B Pump Start - LOCA TD Relay (One relay)	No	Actuate LPCI B system division	One LPCI B Pump Start LOCA TD Relay	None	The input actuation relays are modeled and will be used as equivalent surrogates. These are equivalent because they fail the individual pump start function, same as the TD Relays.
		2.d. LPCI C Pump Start - LOCA TD Relay (One relay)	No	Actuate LPCI C system division	One LPCI C Pump Start LOCA TD Relay	None	
		2.e. LPCI Pump B Start - LOCA/LOOP TD Relay (One relay)	Yes	Actuate LPCI B system division	One LPCI B Pump Start LOCA/LOOP TD Relay	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program
		2.f. RVP – Low (Injection permissive) (Two pressure channels per division)	Yes	Permit LPCI Injection	One RVP – Low pressure channel per ECCS pump discharge valve	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		2.h. Manual Initiation (Two channels – one switch/ PB pair per division)	Yes	Manually actuate ECCS pump	Both channels of a switch/PB pair for division	Single switch data boundary used.	The use of a single basic event for a dual channel switch/PB pair is equivalent.
		3. ECCS Actuation Instrumentation HPCS System					
		3.c. RVWL – High Level 8 (Two channels)	No	Close HPCS injection valve to prevent steam line overflow.	Two RVWL- High Level 8 channels	None	See Note 2
		3.g. Manual Initiation	Yes	Manually Actuate HPCS pump	Both channels of a switch/PB pair	Single switch data boundary used.	The use of a single basic event for a dual channel switch/PB pair is equivalent.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.D	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	**3. ECCS Actuation Instrumentation HPCS System**					
		3.d. Condensate Storage Tank (CST) Level - Low (Two channels)	Yes	Change HPCS suction from CST to Suppression Pool for continued HPCS operation	One of two channels of CST Level – Low <u>OR</u> One channel of SPWL - High	One of four channels of CST Level - Low <u>OR</u> One channel of SPWL-High	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program. Two additional non-TS CST-Level – Low channels are modeled explicitly with the same detail as TS channels.
		3.e. Suppression Pool Water Level (SPWL) - High (Two channels)	Yes				

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.E	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	**1. ECCS Actuation Instrumentation for LPCI A and LPCS Subsystems**					
		1.g. LPCS Pump Discharge Flow - Low (Minimum Flow) (One channel)	Not Explicitly	Open pump minimum flow valve on low flow. Drop signal on not low flow.	One low flow switch actuates	Minimum flow valve opens	See Note 5
		1.h. LPCI Pump A Discharge Flow - Low (Minimum Flow) (One channel)	Not Explicitly	Open pump minimum flow valve on low flow. Drop signal on not low flow.	One low flow switch actuates	Minimum flow valve opens	See Note 5
		2. ECCS Actuation Instrumentation for LPCI B and LPCI C Subsystems					
		2.g. LPCI Pumps B & C Discharge Flow - Low (Minimum Flow) (One channel)	Not Explicitly	Open pump minimum flow valve on low flow. Drop signal on not low flow.	One low flow switch actuates	Minimum flow valve opens	See Note 5
		3. ECCS Actuation Instrumentation HPCS System					
		3.f. HPCS System Flow Rate – Low (Minimum Flow) (One channel)	Not Explicitly	Open pump minimum flow valve on low flow. Drop signal on not low flow.	One low flow switch actuates	Minimum flow valve opens (Flow switch drops signal)	See Note 5 (Flow switch modeled explicitly to close valve when required.)

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.F	ECCS	**ADS initiation logic and instrumentation functions**					
	Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	4.a. RVWL – Low Low Low, Level 1 (Two channels)	No	Initiate ADS Train A	Two Reactor Vessel Water Level – Low Low Level 1 channels in either of two ADS actuation systems	None ADS Inhibit assumed. Only manual depressuri-zation credited	Failure of Train A ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		5.a. RVWL – Low Low Low, Level 1 (Two channels)	No	Initiate ADS Train B			Failure of Train B ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		4.c. RVWL – Low Level 3 (Permissive) (One channel)	No	ADS Permissive Train A	One-RVWL – Low Level 3 channel in either of two ADS actuation systems	None ADS Inhibit assumed. Only manual depressuri-zation credited	Failure of Train A ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		5.c. RVWL – Low Level 3 (Permissive) (One channel)	No	ADS Permissive Train B			Failure of Train B ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		4.f. Accumulator Backup Compressed Gas System Pressure – Low (Three channels)	No	Align backup nitrogen on low header gas pressure	Two-out-of-three compressed gas header system pressure – Low in either of two ADS actuation systems	One of two nitrogen bottle racks supplying the ADS safety related compressed gas header.	A conservative surrogate of unavailability of the Train A nitrogen supply header will be used.
		5.e. Accumulator Backup Compressed Gas System Pressure – Low (Three channels)	No				A conservative surrogate of unavailability of the Train B nitrogen supply header will be used.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.1.G	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	**ADS initiation logic and instrumentation functions**					
		4.b. ADS Initiation Timer (One channel)	No	Initiate ADS Timer Train A	One Automatic Depressurization System Initiation Timer channel on either of two ADS actuation systems	None, ADS Inhibit assumed. Only manual depressuri-zation credited	Failure of Train A ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		5.b. ADS Initiation Timer (One channel)	No	Initiate ADS Timer Train B			Failure of Train B ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		4.d. LPCS Pump Discharge Pressure – High (Two channels)	No	Permissive for ADS Actuation Train A	Two pump discharge pressure – high channels on one pump in either ADS actuation system	None, ADS Inhibit assumed. Only manual depressuri-zation credited	Failure of Train A ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		4e. LPCI Pump A Discharge Pressure – High (Two channels)	No	Permissive for ADS Actuation Train A			
		5.d. LPCI Pumps B & C Discharge Pressure – High (Four channel)	No	Permissive for ADS Actuation Train B			Failure of Train B ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		4.g. Manual Initiation (Four channels – two switch/ PB pairs per ADS trip system)	No	Manual ADS SRV Train A SOVs	Four switch channels from two ADS manual initiation switch/PB pairs in either of two ADS actuation systems.	None, ADS Inhibit assumed. Only manual depressuri-zation credited	Failure of Train A ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)
		5.f. Manual Initiation (Four channels – two switch/ PB pairs per ADS trip system)	No	Manual ADS SRV Train B SOVs			Failure of Train B ADS SOVs to open is used as an equivalent surrogate for RICT calculation (See Note 6)

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.5.3.B	Reactor Core Isolation Cooling (RCIC) System Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.3-1	Reactor Vessel Water Level-Low Low, Level 2 channels (Four channels)	Yes	RCIC initiation	Two RVWL- Low Low Level 2 channels (one in each division subsystem)	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.3.5.3.D	RCIC System Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.3-1	Condensate Storage Tank Level Sensors (Two channels)	Yes	Initiate swap of RCIC suction from CST to Suppression Pool	One Condensate Storage Tank Level – Low channel	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.6.1.A	Primary Containment Isolation Instrumentation - one or more channels inoperable	**1. Main Steam Line (MSL) Isolation**					
		1.a. Reactor Vessel Water Level – Low Low Low, Level 1 (Four channels)	Yes	Automatic isolation of Main Steam Isolation Valves (MSIVs)	Two RVWL Low Low Level 1 channels, one in each trip system	Same as Design Success Criteria	See Note 7
		1.b. Main Steam Line Pressure – Low (Four channels)	Yes	Automatic isolation of MSIVs	Two MSL Pressure - Low channels, one in each trip system	Same as Design Success Criteria	See Note 7
		1.c. Main Steam Line Flow – High (16 channels, four per line)	Yes	Automatic isolation of MSIVs	Two MSL Flow - High channels, one in each trip system	Same as Design Success Criteria	See Note 7
		1.d. Condenser Vacuum – Low (Four channels)	Yes	Automatic isolation of MSIVs	Two Condenser Vacuum - Low, one in each trip system	Same as Design Success Criteria	See Note 7
		1.e. Main Steam Tunnel temperature – high (Four channels)	No	Automatic isolation of MSIVs	Two Main Steam Tunnel Temperature - High channels, one in each trip system	None	See Note 7.a
		1.f. Main Steam Tunnel Differential Temperature – High (Four channels)	No	Automatic isolation of MSIVs	Two Main Steam Tunnel Differential Temperature - High channels, one in each trip system	None	See Note 7.a
		1.g. Manual Initiation (Four switch/PB pairs)	Yes	Manual isolation of MSIVs	Two switch/PB pairs, one pair in each trip system.	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.6.1.A (cont.)		**2. Primary Containment Isolation**					
		2.a. Reactor Vessel Water Level – Low, Level 3 (Four channels)	No	Automatic isolation of Primary Containment Isolation Valves (PCIVs)	Two RVWL Low, Level 3 channels in either of two trip systems	None	See Note 7.d
		2.b. Reactor Vessel Water Level – Low Low, Level 2 (Four channels)	Yes	Automatic isolation of PCIVs	Two RVWL Low, Low, Level 2 channels in either of two trip systems	Same as Design Success Criteria	See Note 7
		2.c. Drywell Pressure – High (Four channels)	Yes	Automatic isolation of PCIVs	Two Drywell Pressure High channels in either of two trip systems	Same as Design Success Criteria	See Note 7
		2.d. Reactor Building Vent Exhaust Plenum Radiation (RBVEPR) – High (Four channels)	No	Automatic isolation of PCIVs	Two RBVEPR - High channels in either of two trip systems	None	See Note 7.d
		2.e. Manual Initiation (Four switch/PB pairs)	Yes	Manual isolation of PCIVs	Group 3: Two switch/PB pairs in either trip system Groups: 2,4,5: One switch/PB pair in either trip system per group	One switch /PB pair (Only Group 4 Isolation valves contributing to LERF are modeled)	Failure of modeled isolation valves contribute to LERF and bound the effect on unmodeled isolation valves in the other isolation groups.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.6.1.A (cont.)		**3. Reactor Core Isolation Cooling (RCIC) System Isolation**					
		3.a. RCIC Steam Line Flow – High (Two channels)	No	Automatic Isolation of RCIC	One Steam Line Flow - high channel on either isolation system	None	See Note 7.d
		3.b. RCIC Steam Line Flow – Time Delay (Two channels)	No	Automatic Isolation of RCIC	One Steam Line Flow - TD channel on either isolation system	None	See Note 7.d
		3.c. RCIC Steam Supply Pressure – Low (Four channels)	No	Automatic Isolation of RCIC	Two RCIC Steam Supply Pressure – Low channels on either isolation system	None	See Note 7.d
		3.d. RCIC Turbine Exhaust Diaphragm Pressure (TEDP) – High (Four channels)	No	Automatic Isolation of RCIC	Two RCIC TEDP – High channels on either isolation system	None	See Note 7.d
		3.e. RCIC Equipment Room Area Temperature (ERAT) – High (Two channels)	No	Automatic Isolation of RCIC	One RCIC ERAT – High channel on either isolation system	None	See Note 7.d
		3.f. RCIC Equipment Room Area Differential Temperature (ERADT) – High (Two channels)	No	Automatic Isolation of RCIC	One RCIC ERADT – High channel on either isolation system	None	See Note 7.d
		3.g. Reactor Water Cleanup (RWCU) System /RCIC Steam Line Routing Area Temperature (SLRAT) – High (Two channels)	No	Automatic Isolation of RCIC	One RWCU System/ RCIC SLRAT - High channel on either isolation system	None	See Note 7.d

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.6.1.A (cont.)		3.h. Manual Initiation (One channel)	No	Manual Isolation of RCIC	One Manual switch (closes outboard valve)	None	See Note 7.d
		4. Reactor Water Clean-Up (RWCU) System Isolation					
		4.a. Differential Flow – High (Two channels)	Yes	Automatic Isolation of RCWU valves	One Differential Flow – High channel on either isolation system	Same as Design Success Criteria	See Note 7
		4.b. Differential Flow – Time Delay (Two channels)	Yes	Automatic Isolation of RCWU valves	One Differential Flow TD channel on either isolation system	Same as Design Success Criteria	See Note 7
		4.c. Blowdown Flow – High (Two channels)	No	Automatic Isolation of RCWU valves	One Blowdown Flow - High channel on either isolation system	None	See Note 7.b
		4.d. Heat Exchanger Room Area Temperature – High (Two channels)	No	Automatic Isolation of RCWU valves	One Heat Exch. Room Area Temperature – High channel on either isolation system	None	See Note 7.b
		4.e. Heat Exchanger Room Area Ventilation Differential Temperature – High (Two channels)	No	Automatic Isolation of RCWU valves	One Heat Exch. Room Area Ventilation Differential Temperature - High channel on either isolation system	None	See Note 7.b
		4.f. Pump Room Area – Temperature High (Four channels, two per area)	No	Automatic Isolation of RCWU valves	One Pump Room Area Temperature – High channel on either isolation system	None	See Note 7.b

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.6.1.A (cont.)		4.g. Pump Room Area Ventilation Differential Temperature – High (Four channels, two per area)	No	Automatic Isolation of RCWU valves	One Pump Room Area Diff. Temp. – High channel on either isolation system	None	See Note 7.b
		4.h. RWCU/RCIC Line Routing Area Temperature – High (Two channels)	No	Automatic Isolation of RCWU valves	One RWCU/RCIC Line Routing Area Temperature – High on either isolation system	None	See Note 7.b
		4.i. RWCU Line Routing Area Temperature – High (8 channels, two per area)	No	Automatic Isolation of RCWU valves	One RWCU Line Routing Area Temperature – High on either isolation system	None	See Note 7.b
		4.j. Reactor Vessel Water Level – Low Low, Level 2 (Four channels)	Yes	Automatic Isolation of RCWU valves	Two RVWL Low, Low, Level 2 channels in either of two trip systems	Same as Design Success Criteria	See Note 7
		4.k. Standby Liquid Control (SLC) System Initiation (Two channels)	No	Automatic Isolation of RCWU valves	One SLC System Initiation channel on either isolation system	None	See Note 7.b
		4.l. Manual Initiation (Two per switch/PB pair)	Yes	Manual Isolation of RCWU valves	One switch/PB pair on either isolation system	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.6.1.A (cont.)		**5. Residual Heat Removal (RHR) Shutdown Cooling(SDC) System Isolation (Function e. and f.)**					
		5.e. Reactor Vessel Pressure – High (Two channels)	No	Automatic Isolation of RHR SDC valves	One RVP – High channel on either isolation system	None	See Note 7.c
		5.f. Manual Initiation (Four channels, two per switch/PB pair)	No	Manual isolation of RHR SDC valves	One switch/PB pair on either isolation system	None	See Note 7.c
		6.Traverse Incore Probe (TIP) Isolation					
		6.a. Reactor Vessel Water Level – Low, Low, Level 2 (Two channels)	No	Automatic isolation of TIP valves	One RVWL- Low, Low, Level 2 channel <u>OR</u> one Drywell Pressure – High in each trip system	None	See Note 7.d
		6.b. Drywell Pressure – High (Two channels)	No	Automatic isolation of TIP valves			See Note 7.d

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.8.1.B	Loss of Power (LOP) instrumentation - As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	**1. Divisions 1 and 2 - 4.16 kV Emergency Bus Undervoltage**					
		1.a.TR-S Loss of Voltage (LOV) – 4.16 kV Basis (Four channels, two per bus)	No	LOV sensing capability and time delay to initiate trip of offsite power circuit, start the associated emergency diesel generator (DG) and initiate source transfer to connect to the next available power source on Division 1 or 2 4.16 kV bus.	One LOV channel per bus	None	Function 1.a will be conservatively mapped to modeled relays that fail DG LOV start signal and TR-B transfer, which are affected circuits of the LOV channels. Operable LOV channel will conservatively not be credited for RICT.
		1.b. Loss of Voltage - Time Delay (Four channels, two per bus)	Yes		Two Time Delay channels per bus	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		2. Division 3 – 4.16kV Emergency Bus Undervoltage (See Note 8)					
		2.a. Loss of Voltage – 4.16 kV Basis (Two channels)	Yes	LOV sensing capability and time delay to initiate trip of offsite power circuit, start emergency DG 3 and initiate source transfer to connect to the next available power source on Division 3 4.16 kV bus.	One LOV channel	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		2.b. Loss of Voltage Time Delay (Four channels)	Yes		Two Time Delay channels	Same as Design Success Criteria	

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.3.8.1.C	Loss of Power (LOP) instrumentation - As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	**1. Divisions 1 and 2 - 4.16 kV Emergency Bus Undervoltage (See Note 8)**					
		1.c. TR-B Loss of Voltage - 4.16 kV Basis (Two channels, one per bus)	Yes	Sense LOV on Backup Transformer and Transfer Bus to DG	One LOV channel per Bus	Same as Design Success Criteria.	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		1.d. TR-B Loss of Voltage - Time Delay (Six channels, three per bus)	Yes	Time Delay for power recovery	Three TD channel per bus	Same as Design Success Criteria.	
		1.e. Degraded Voltage (DV) - 4.16 kV Basis (Six channels, three per bus)	Yes	Sense Essential Bus DV and Transfer Bus to DG	Two DV channels per bus	Same as Design Success Criteria.	
		1.f. Degraded Voltage - Primary Time Delay (Six channels, three per bus)	Yes	Time Delay for power recovery	Two DV Primary TD Channels per bus	Same as Design Success Criteria.	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		1.g. Degraded Voltage - Secondary Time Delay (Six channels, three per bus)	Yes	Time Delay for power recovery	Three DV Secondary TD Channel per bus	Same as Design Success Criteria.	
		2. Division 3 – 4.16kV Emergency Bus Undervoltage					
		2c. Degraded Voltage - 4.16 kV Basis (Three channels)	Yes	Sense HPCS Bus DV and Transfer to DG	Two DV Channels	Same as Design Success Criteria.	SSCs are modeled consistent with the TS scope and can be directly included in the CRM tool for the RICT program.
		2d. Degraded Voltage - Time Delay (Three channels)	Yes	Time Delay fore power recovery	Two DV Time Delay channels	Same as Design Success Criteria.	

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.A	One low pressure ECCS injection/spray subsystem inoperable	Three LPCI trains and one LPCS train	Yes	Low pressure injection/spray into the Reactor Pressure Vessel (RPV)	One ECCS Low Pressure Pump subsystem	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.5.1.B	High Pressure Core Spray (HPCS) System inoperable	HPCS components	Yes	High pressure spray into the RPV	One of one HPCS system (RCIC is the diverse high pressure makeup source)	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.5.1.C	Two ECCS injection subsystems inoperable <u>OR</u> One ECCS injection and one ECCS spray subsystem inoperable	Three LPCI trains, one LPCS train, one HPCS train	See 3.5.1.A and 3.5.1.B				
3.5.1.E	One required ADS valve inoperable	Seven ADS Safety Relief Valves (SRVs) and supporting components	Yes	Vessel depressurization	Five of seven ADS SRVs	Three of seven ADS SRVs <u>OR</u> three of eleven non-ADS SRVs	The success criterion is based on MAAP and RETRAN (GE NEDC-30936P) best-estimate analyses. See Note 6

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.5.1.F	One required ADS valve inoperable. AND One low pressure ECCS injection/spray subsystem inoperable	Seven ADS SRVs, supporting components, three LPCI trains, and one LPCS train	See 3.5.1.A and 3.5.1.E				
3.5.3.A	Reactor Core Isolation Cooling (RCIC) System inoperable	RCIC components	Yes	Supply high pressure makeup water to the RPV.	One of one train of RCIC (HPCS is the diverse high pressure makeup source)	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.6.1.2.C	Primary containment air lock inoperable for reasons other than Condition A or B	Primary containment air lock equipment	No	Primary Containment boundary maintained	One of two doors maintain boundary	None	See Note 9. The airlocks are not modeled so a large pre-existing containment isolation failure will be used as a conservative surrogate for the RICT calculation.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.6.1.3.A	------NOTE------ Only applicable to penetration flow paths with two PCIVs ------------------- One or more penetration flow paths with one PCIV inoperable for reasons other than Condition D	Primary Containment Isolation Valves	Partial	To limit fission product release during and following postulated Design Basis Accident (DBAs)	One of two isolation valves closed per penetration	Same as Design Success Criteria	Note 10
3.6.1.5.A	One RHR drywell spray subsystem inoperable	Two RHR drywell spay sub-systems with two motor-operated valves, piping and spray headers per sub-system	Yes	To mitigate the effects of potential bypass leakage paths and maintain the primary contain-ment peak pressure below design limits.	One RHR Drywell Spray subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.6.1.6.C	One line with one or more reactor building-to-suppression chamber vacuum breakers inoperable for opening	Three lines with two vacuum breakers in series per line	No	Relieve vacuum in the suppression chamber post LOCA	Two of Three Vacuum Breaker lines open	None	See Note 11
3.6.1.7.A	One required suppression chamber-to-drywell vacuum breaker inoperable for opening.	Nine lines with two vacuum breakers in series per line.	No	Relieve vacuum in drywell post LOCA	Six of Nine Vacuum Breaker lines open	None	See Note 12

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	RHR pumps, valves and heat exchangers (See Note 13)	Yes	Removal of heat from the Suppression Pool	One of two RHR Suppression Pool Cooling subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.7.1.B	Standby Service Water (SW): One SW subsystem inoperable	Two independent cooling water headers (Subsystems A and B), and their associated pumps, piping, valves, and instrumentation.	Yes	To provide cooling water for the RHR·system heat exchangers, diesel generators, room coolers, and ECCS components	One of two SW subsystems	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.1.A	One offsite circuit inoperable	The start-up auxiliary transformer TR-S is the preferred offsite power source, and transformer TR-B is the backup offsite power source.	Yes	TR-S supplies auxiliary AC loads following plant trip for ESF load groups in divisions 1, 2 and 3 and TR-B provides AC power to ESF load groups in divisions 1 and 2 only	One offsite source or two of three emergency power sources	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.1.B	One required DG inoperable	Three emergency DGs, their support systems, one emergency DG per division 1, 2 and 3 ESF load group.	Yes	Supply AC loads during abnormal operation when offsite power to and ESF 4.16kV bus is lost	One offsite source or two of three emergency power sources	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.1.C	Two offsite circuits inoperable	See 3.8.1.A					

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.8.1.D	One offsite circuit inoperable AND one required DG inoperable	See 3.8.1.A and 3.8.1.B					
3.8.4.A	One required Division 1 or 2 125 VDC battery charger inoperable	Two primary battery chargers. (See Note 14)	Yes	To provide DC loads during normal operation	One Division 1 or 2 125 VDC battery charger capable of supporting minimum safety functions.	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.4.B	One required Division 3 125 VDC battery charger inoperable.	One Battery Charger	Yes	To provide DC loads during normal operation	One Division 3 125 VDC battery charger capable of supporting HPCS functions.	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.4.C	One required Division 1 250 VDC battery charger inoperable	One Battery Charger	Yes	To provide DC loads during normal operation	One Division 1 250VDC battery charger subsystem capable of supporting minimum safety functions.	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.4.D	One required Division 1 or 2 125 VDC battery inoperable	The Division 1 and 2 125 VDC batteries and interconnecting cabling	Yes	To provide DC loads during abnormal operation	One Division 1 or 2 125 VDC battery subsystem capable of supporting minimum safety functions.	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.4.E	One required Division 3 125 V DC battery inoperable.	The Division 3 125 VDC battery and interconnecting cabling	Yes	To provide DC loads during abnormal operation	One Division 3 125 VDC battery capable of supporting HPCS functions.	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.

Table E1-1: In-scope TS/LCO Conditions to Corresponding PRA Functions

CGS TS	CGS TS Description	SSCs Covered by TS LCO Condition	Modeled in PRA	Function Covered by TS LCO Condition	Design Success Criteria	PRA Success Criteria	Comments
3.8.4.F	One required Division 1 250 V DC battery inoperable.	The Division 1 250 VDC battery and interconnecting cabling	Yes	To provide DC loads during abnormal operation	One DC electrical power distribution subsystem capable of supporting minimum safety functions	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.4.G	Division 1 or 2 125 V DC electrical power subsystem inoperable for reasons other than Condition A or D.	The Division 1 and 2 125 VDC breakers, instrumentation, and supports.	Yes	To provide DC loads during normal and abnormal operation	One DC electrical power distribution subsystem capable of supporting minimum safety functions	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program.
3.8.7.A	Division 1 or 2 AC electrical power distribution subsystem inoperable	4.16kV buses, 480V load centers and distribution panels, and 120V panels	Yes (Some 120V/ 240V AC power panels not modeled) (Note 15)	AC power distribution to the required Divisional Loads	One AC electrical power distribution subsystem capable of supporting minimum safety functions	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program. (For unmodeled distribution panels, see Note 15)
3.8.7.B	Division1 or 2 125 VDC electrical power distribution subsystem inoperable	Two divisions of DC distribution	Yes (Some 125VDC panels not modeled) (Note 16)	DC power distribution to the required Divisional Loads	One DC electrical power distribution subsystem capable of supporting minimum safety functions	Same as Design Success Criteria	SSCs are modeled consistent with the TS scope and so can be directly included in the CRM tool for the RICT program. (For unmodeled distribution panels, see Note 16)

Table E1-1 Notes:

1. Individual RPS instrumentation inputs to the RPS logic system are not modeled in the PRA. The RPS failure probability is based on the NUREG-CR/5500 Volume 3 model (Reference 6). The PRA model uses a single point estimate event to represent RPS failure due to electrical SSC failures. For the RICT calculation, the Reference 6 model cutsets were reviewed and a probability of failure of each of the four sub-systems (channels) was developed. A new simplified RPS model using the four sub-system failure events was developed based on the one-out-of-two taken twice logic. This new RPS model generates the exact base probability of the NUREG-CR/5500 model. For any subsystem with a function considered inoperable or bypassed, the associated subsystem event was failed in this new RPS model to calculate the RICT. This new simplified RPS model was validated to provide more conservative results than the NUREG-CR-5500 model when a function channel is inoperable or bypassed. This new simplified RPS model is used to calculate the values in Table E1-2 with two subsystems out of service (one bypassed and another inoperable), which is allowed for some functions. This RPS model addresses both Condition A and Condition B of TS 3.3.1.1. The CGS PRA CRM program model will be updated to use this new simplified RPS electrical failure logic model prior to RICT program implementation. This is not a model upgrade, but only a model maintenance item and does not introduce any new PRA methods.
2. There are three reactor feedwater system channels of Reactor Vessel Water Level (RVWL) – High used to trip the reactor feed pumps (RFPs) and the main turbine. Failure of the RFP and the main turbine high water level trip functions are not modeled. Failure or unavailability of these trip functions could result in damage to the RCIC turbine, RFP turbines, and main turbine, of which RCIC and the RFPs provide PRA functions. A similar impact from the HPCS discharge valve isolation signal on RVWL high is expected. As a conservative surrogate for the maintenance of any TS 3.3.2.2.A high water level channel or TS 3.3.5.1.C function 3.c. high water level channel, RCIC and the RFPs will be failed. This is conservative because the RCIC and RFPs are assumed failed regardless of a failure of reactor vessel level control and failure of all channels of the trip function.
3. The EOC-RPT instrumentation initiates a recirculation pump trip (RPT) to reduce the peak reactor pressure and power resulting from turbine trip or generator load rejection transients to provide additional margin to the core thermal MCPR Safety Limit. This is not a PRA modeled function. However, EOC-RPT provides another backup to the ATWS-RPT for load reject transients and can be conservatively assessed using a surrogate. Failure of recirculation pump breakers to trip will be used as a conservative surrogate for the RICT calculation. The surrogate is conservative as the breakers are tripped by the EOC-RPT logic. Thus, the RICT calculated for this surrogate is bounding for each channel because one channel out of service does not prevent the trip of the RPT breakers.
4. ATWS-RPT system instrumentation is part of the redundant reactivity control system and has 2 independent trip systems each composed of two channels of each functional input. Each trip system uses a 2-out-of-2 logic for each function. Thus, either two Reactor Water Level - Low Low, Level 2 or two Reactor Vessel Steam Dome Pressure - High signals are needed to trip a trip system. One trip system trips one recirculation pump and the other system trips the other recirculation pump.
5. Instrumentation to open minimum flow valves is not modeled explicitly but is modeled as within the valve component boundary. Therefore, the minimum flow valve events are used as instrumentation surrogates.

6. The Fire PRA models individual SOVs and dependencies for each SRV (ADS and non-ADS). For the RICT evaluation in Table E1-2, the Fire PRA logic was also added to the Internal events, Internal flood, and Seismic hazards models for the quantification. Additionally, ADS SRVs are only modeled by common cause failures or their supporting SOVs and supports. For the RICT calculation, individual ADS SRV valve body independent failure to open events were added. This logic will be included in the CRM program models for all hazards prior to RICT program implementation. This is not a model upgrade, but only a model maintenance item and does not introduce new PRA methods.

7. One isolation system is associated with the inner primary containment isolation valves and the other isolation system is associated with the outer primary containment isolation valves with the success criteria being closure of one of the two isolation valves. Where SSCs are modeled consistent with the TS scope, SSC will be directly used for unavailability in the CRM tool for the RICT program. Otherwise, the use of surrogates will be as follows:

   a. For functions 1.e, MS isolation on MS tunnel temperature – high, and 1.f, MS isolation on MS tunnel differential temperature – high, will use the leak detection (LD) monitors for each inoperable channel as a conservative surrogate. The LD monitors are modeled in the PRA, but the individual temperature elements are not modeled in the PRA. Two LD monitors each receive inputs from two MS tunnel temperature channels (one element per channel) and two MS tunnel differential temperature channels (two elements per channel). With one or more elements inoperable, the associated TD monitor(s) will be failed in the PRA. This is conservative because diversity for functions 1.e and 1.f will not be credited.
   b. For RWCU isolation function 4.f, Pump Room Temperature – high channels will use the LD monitors for each inoperable channel as a conservative surrogate. The LD monitors are modeled in the PRA, but the individual temperature elements are not modeled in the PRA. Two LD monitors each receive inputs from two temperature elements channels each. With one or more element inoperable, the associated TD monitor(s) will be failed in the PRA. This is conservative because redundancy of two channels per monitor is not credited for function 4.f. For other unmodeled Function 4 subsets, the RWCU isolation valve will be failed open as a conservative surrogate for the associated instrumentation subsystem, unless the valve is isolated and de-energized. This is conservative because one channel inoperable will not render the associated isolation valve not closable.
   c. For functions 5.e. and 5.f, a RHR shutdown cooling suction line isolation MOV will be failed open as a conservative surrogate for the associated instrumentation subsystem, unless the MOV is isolated and de-energized. This is conservative because one channel inoperable will not render the associated isolation valve not closable.
   d. For other unmodeled functions (2.a, 2.d, 3 and 6) a large pre-existing containment isolation failure will be used as a conservative surrogate for the LCO condition. See Notes 9 and 10 for the background of the large pre-existing containment failure event and how it will be applied. This approach is conservative because unmodeled functions have been determined not to contribute to LERF.

8. Each 4.16 kV emergency bus has its own independent LOP instrumentation and associated trip logic. The voltage for the Division 1, 2, and 3 buses is monitored at two levels, which can be considered as two different undervoltage functions: loss of

voltage and degraded voltage. For Division 1 and 2, the loss of voltage function is monitored by two instruments per bus and the degraded voltage is monitored by three instruments per bus. The degraded voltage signal is generated when a degraded voltage occurs for a specified time interval and also provides a backup for the undervoltage functions.

9. The containment air locks are not explicitly modeled in the CGS PRA. Since the containment airlocks are not modeled, there are no explicit PRA Success Criteria. However, the LCO condition will be modeled using the pre-existing large containment isolation failure as a conservative surrogate in the PRA. The pre-existing large containment failure event probability was derived by the Pacific Northwest Laboratory (PNL) for the NRC (see EPRI Risk Impact Assessment of Extended Integrate Leak Rate Test Intervals, TR-101824) plus the use of NUREG-1493. Columbia is not an outlier in the use of this generic industry accepted data that addresses the operating experience-based probability of containment release pathways being larger than “small”. Because the containment hatch doors have no dependencies, for the LCO condition, it is appropriate to increase the failure probability of the surrogate event in the CRM program (versus setting to logical True) for the RICT calculation. This added probability represents the likelihood of failure of the redundant operable door. A bounding probability was derived from the square root of the pre-existing large isolation failure probability. The RICT in Table E1-2 was calculated using this approach.

10. Where PCIV SSCs are modeled consistent with the TS scope, unavailability can be directly included in the CRM tool for the RICT program. Unmodeled PCIVs were screened in the PRA due to from LERF consideration based on PCIVs being smaller than 2 inches or if the PCIV isolates a closed system inside containment. However, a conservative assessment using a surrogate pre-existing large containment isolation failure will be used to address individual unmodeled PCIV unavailability (See basis for event in Note 9). Although very conservative, screened penetrations shall be assessed with this surrogate. Where the redundant unisolated operable isolation valve(s) is(are) fail safe, the respective failure probability(ies) shall be added to the surrogate event in the CRM program. If any remaining unmodeled unisolated operable isolation valve is not fail safe, the surrogate shall be set to failed (logical True) for the LCO condition. The RICT values in Table E1-2 were calculated assuming the redundant valve is not fail safe and the surrogate event was set to logical True. This approach is conservative because unmodeled PCIV SSCs have been determined not to contribute to LERF.

11. Failure of the drywell spray is used as a conservative surrogate for reactor building to suppression chamber vacuum breakers. For sequences requiring drywell spray, success of vacuum breakers was assumed in the PRA, and the possibility of failure was screened as insignificant. Failure of sprays is modeled to cause containment failure. For the LCO condition, failure of the drywell spray function is a conservative surrogate. This approach is conservative because a single vacuum breaker unavailability will not result in failure of the spray function or containment failure for the accidents for which spray is modeled.

12. If sufficient suppression pool to drywell vacuum breakers fail to open under certain accident sequences, failure of the drywell floor may occur and a loss of LOCA vapor suppression will occur. The drywell floor seal failure event is a conservative surrogate to model vapor suppression bypass. For the LCO condition, the event probability will be increased to that of a bounding common cause factor given a single vacuum breaker is failed. This approach is conservative because a single vacuum breaker unavailability will result in an insignificant increase in the vacuum breaker function unreliability, and the common cause factor is orders of magnitude higher than the calculated risk. Further, if common cause is determined, then the extent of condition determination will result in multiple vacuum breakers inoperable, and a RICT will not be entered.
13. The RHR system contains three separate pump trains, two of which contain heat exchangers for heat removal. The third pump train is for LPCI functions only.
14. Each Division 1 and 2 125 VDC sub-system has a maintenance spare battery charger that is normally isolated that can be aligned to meet the LCO requirements.
15. 120/240V 1 Phase power panels PP-7A-F, PP-8A-G, and PP-4A, and 120/208V 3 phase power panels PP-7A-A-A and PP-8-A-A-A are not modeled in the PRA and will use the source motor control center or power panel as a conservative surrogate. This is conservative because additional PRA loads will be impacted by the surrogate being inoperable.
16. 125V DC distribution panels DP-S1-1E and MC-S1-2D are not modeled in the PRA and will use the source motor control system or power panel as a conservative surrogate.

RICTs were calculated for both trains when applicable and the most limiting RICT is specified in Table E1-2. Following implementation of the RICT Program, the actual RICT values will be calculated using the actual plant configuration and the current revision of the PRA model representing the as-built, as-operated condition of the plant, as required by NEI 06-09-A, Revision 0 and the NRC Final Safety Evaluation.

RICTs are based on the internal events (including internal flooding), internal fire, and seismic PRA model calculations for CDF and LERF. RICTs calculated to be greater than 30 days are capped at 30 days based on NEI 06-09-A, Revision 0. RICTs not capped at 30 days are rounded to nearest number of days.

Per NEI 06-09-A, Revision 0, for cases where the total CDF or LERF is greater than 1E-03/yr or 1E-04/yr, respectively, the RICT Program will not be entered.

Table E1-2: In-Scope TS/LCO Conditions RICT Estimate

Tech Spec	LCO Condition	RICT Estimate
3.1.7.A	One SLC subsystem inoperable.	30 Days
3.3.1.1.A	Reactor Protection System (RPS) instrumentation - one or more required channels inoperable	30 Days
3.3.1.1.B	---------------------------NOTE------------------------------- Not applicable for Functions 2.a, 2.b, 2.c, 2.d, or 2.f --- One or more Functions with one or more required channels inoperable in both trip systems.	30 Days
3.3.2.2.A	One feedwater pump and main turbine high water level trip channels inoperable.	30 Days
3.3.4.1.A	End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation - One or more required channels inoperable.	30 Days
3.3.4.2.A	Anticipated Transient Without SCRAM Recirculation Pump Trip (ATWS-RPT) Instrumentation - one or more channels inoperable	30 Days
3.3.5.1.B	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	30 Days
3.3.5.1.C	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	30 Days
3.3.5.1.D	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	30 Days
3.3.5.1.E	ECCS Instrumentation - As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	30 Days
3.3.5.1.F	ECCS Instrumentation - As required by Required Action A.1	30 Days

Table E1-2: In-Scope TS/LCO Conditions RICT Estimate

Tech Spec	LCO Condition	RICT Estimate
	and referenced in Table 3.3.5.1-1.	(Note 1)
3.3.5.1.G	ECCS Instrumentation – As required by Required Action A.1 and referenced in Table 3.3.5.1-1.	30 Days (Note 1)
3.3.5.3.B	Reactor Core Isolation Cooling (RCIC) System Instrumentation – As required by Required Action A.1 and referenced in Table 3.3.5.3-1	30 Days
3.3.5.3.D	RCIC System Instrumentation – As required by Required Action A.1 and referenced in Table 3.3.5.3-1	30 Days
3.3.6.1.A	Primary Containment Isolation Instrumentation – one or more channels inoperable	9.8 Days (Note 2)
3.3.8.1.B	Loss of Power (LOP) instrumentation – As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	30 Days
3.3.8.1.C	Loss of Power (LOP) instrumentation – As required by Required Action A.1 and referenced in Table 3.3.8.1-1.	30 Days
3.5.1.A	One low pressure ECCS injection/spray subsystem inoperable	30 Days
3.5.1.B	High Pressure Core Spray (HPCS) System inoperable	18.9 Days
3.5.1.C	Two ECCS injection subsystems inoperable <u>OR</u> One ECCS injection and one ECCS spray subsystem inoperable	5.5 Days (Note 3)
3.5.1.E	One required ADS valve inoperable	30 Days
3.5.1.F	One required ADS valve inoperable. AND One low pressure ECCS injection/spray subsystem inoperable	30 Days
3.5.3.A	Reactor Core Isolation Cooling (RCIC) System inoperable	30 Days
3.6.1.2.C	Primary containment air lock inoperable for reasons other than Condition A or B	30 Days
3.6.1.3.A	----------------------------------NOTE------------------------------ Only applicable to penetration flow paths with two PCIVs --- One or more penetration flow paths with One PCIV inoperable for reasons other than Condition D	9.8 Days (Note 2)
3.6.1.5.A	One RHR drywell spray subsystem inoperable	30 Days
3.6.1.6.C	One line with one or more reactor building-to-suppression chamber vacuum breakers inoperable for opening	30 Days

Table E1-2: In-Scope TS/LCO Conditions RICT Estimate

Tech Spec	LCO Condition	RICT Estimate
3.6.1.7.A	One required suppression chamber-to drywell vacuum breaker inoperable for opening.	30 Days
3.6.2.3.A	One RHR suppression pool cooling subsystem inoperable	30 Days
3.7.1.B	Standby Service Water (SW): One SW subsystem inoperable	11.8 Days
3.8.1.A	One offsite circuit inoperable	30 Days
3.8.1.B	One required DG inoperable	20.5 Days (Note 4)
3.8.1.C	Two offsite circuits inoperable	3.9 Days
3.8.1.D	One offsite circuit inoperable AND one required DG inoperable	4.0 Days (Note 5)
3.8.4.A	One required Division 1 or 2 125 VDC battery charger inoperable	30 Days
3.8.4.B	One required Division 3 125 VDC battery charger inoperable.	20.1 Days
3.8.4.C	One required Division 1 250 VDC battery charger inoperable	30 Days
3.8.4.D	One required Division 1 or 2 125 VDC battery inoperable	6.5 Days
3.8.4.E	One required Division 3 125 V DC battery inoperable.	30 Days
3.8.4.F	One required Division 1 250 V DC battery inoperable.	30 Days
3.8.4.G	Division 1 or 2 125 V DC electrical power subsystem inoperable for reasons other than Condition A or D.	5.2 Days
3.8.7.A	Division 1 or 2 AC electrical power distribution subsystem inoperable	3.5 Days (Note 6)
3.8.7.B	Division 1 or 2 125 V DC electrical power distribution subsystem inoperable	6.8 Days

Table E1-2 Notes:

1. The LCO action statement addresses two variations associated with ADS instrumentation operability, conditions with RCIC and HPCS operable, and conditions where RCIC or HPCS is inoperable. LCOs involving HPCS inoperable and the conservative surrogate of the B train ADS SOVs for an associated ADS instrumentation function channel inoperable calculates a CDF exceeding 1E-3/year, the ultimate instantaneous risk limit. Therefore, a RICT would not be entered unless further analysis to remove conservatism indicates acceptable risk. All other combinations of ADS instrumentation inoperable with and without RCIC inoperable calculates RICTs limited to 30 days.

2. Calculated using most limiting case with pre-existing large containment failure set to TRUE.
3. Unavailability of HPCS and LPCI Train A is the most limiting inoperable combination.
4. Unavailability of DG 2 is most limiting single diesel inoperable condition.
5. Unavailability of DG3 and TR-S is most limiting diesel and offsite power source inoperable combination.

6 The RICT duration represents the most limiting 4kV emergency bus set to logical true in the PRA model. If the LCO condition represented a total loss of the 4kV emergency bus, then the CDF for that bus exceeds 1E-3/year, the ultimate instantaneous risk limit. Therefore, a RICT would not be entered.

2.0 ADDITIONAL JUSTIFICATION FOR SPECIFIC ACTIONS

This section contains the additional technical justification for the list of Required Actions from Table 1, “Conditions Requiring Additional Technical Justification”, of TSTF-505, Revision 2.

Additional justification for each of the identified CGS TS is provided below:

Table E1-3: TSTF-505 Rev 2 Table 1 Technical Specifications (TS) that Require Additional Justification

TS Description	TSTF-505 TS	CGS TS	Additional Justification
Source Range Monitor Instrumentation - One or more required SRMs inoperable in MODE 2 with intermediate range monitors (IRMs) on Range 2 or below.	3.3.1.2.A	3.3.1.2.A	N/A - TSTF-505 changes are excluded.
Feedwater and Main Turbine High Water Level Trip Instrumentation - Two or more feedwater and main turbine high water level trip channels inoperable.	3.3.2.2.B*	3.3.2.2.B	N/A - TSTF-505 changes are excluded.
End of Cycle Recirculation Pump Trip (EOC-RPT) Instrumentation - One or more required channels inoperable.	3.3.4.1.A	3.3.4.1.A	TSTF-505 changes are incorporated. A loss of trip capability for one or more functions would result in entering Condition B, which would restore the trip capability or apply the MCPR limit. A RICT is not being applied to Condition B. Failure of recirculation pump breakers to trip will be used as a surrogate for the RICT calculation. The surrogate is conservative because the breakers are tripped by the EOC-RPT logic. Thus, the RICT calculated for this surrogate is bounding for each channel because one channel out of service does not prevent the trip of the RPT breakers.

Table E1-3: TSTF-505 Rev 2 Table 1 Technical Specifications (TS) that Require Additional Justification

TS Description	TSTF-505 TS	CGS TS	Additional Justification
(Relief and)**Low-Low-Set (LLS) Instrumentation	3.3.6.3.A* 3.3.6.5.A**	----	N/A - TSTF-505 changes are excluded.
Loss of Power (LOP) Instrumentation - One or more channels inoperable.	3.3.8.1.A	3.3.8.1.B 3.3.8.1.C	TSTF-505 changes are incorporated. However, under certain circumstances, with more than one channel inoperable, a loss of safety function may occur. Therefore, a Note is added to the Completion Time which prohibits applying a RICT when a loss of function has occurred.
Primary Containment Air Lock - Primary containment air lock inoperable for reasons other than Condition A or B.	3.6.1.2.C	3.6.1.2.C	TSTF-505 changes are incorporated. Compliance with the remaining portions of LCO Condition 3.6.1.2 ensure that there is a physical barrier (i.e., closed door) and an acceptable overall leakage from containment. Thus, the function is still maintained. Required Action C.1 of LCO Condition 3.6.1.2 requires the condition to be assessed in accordance with TS 3.6.1.1, "Primary Containment" (i.e., "Initiate action to evaluate primary containment overall leakage per LCO 3.6.1.1" with a Completion Time of Immediately). Excessive leakage would require restoration within 1 hour per Required Action A.1 of LCO 3.6.1.1 and if unable to meet the action, would require a plant shutdown.
Primary Containment Isolation Valves (PCIVs) - One or more penetration flow paths with one or more containment purge valves not within purge valve leakage limits.	3.6.1.3.E*	----	Not Applicable
Residual Heat Removal (RHR) Containment	3.6.1.7.A**	3.6.1.5.A	The CGS PRA explicitly models drywell spray. Inoperable

Table E1-3: TSTF-505 Rev 2 Table 1 Technical Specifications (TS) that Require Additional Justification

TS Description	TSTF-505 TS	CGS TS	Additional Justification
Spray system: One RHR containment spray subsystem inoperable.			components can be mapped directly to PRA modeled events.
Reactor Building-to-Suppression Chamber Vacuum Breakers: Two or more reactor building-to-suppression chamber vacuum breakers inoperable for opening.	3.6.1.7.D*	3.6.1.6.E	N/A - TSTF-505 changes are excluded.
Drywell air lock inoperable for reasons other than Condition A or B.	3.6.5.2.C**	----	Not Applicable
Main Turbine Bypass System - Requirements of the LCO not met or Main Turbine Bypass System inoperable.	3.7.7.A* 3.7.6.A**	3.7.6.A	N/A - TSTF-505 changes are excluded.

* Modeled off NUREG-1433

** Modeled off NUREG-1434

3.0 MODELING OF FLEX

FLEX strategies are credited in the Columbia Internal Events, Fire, and Seismic PRA models. The FLEX strategies that are credited in the PRA models are:

- Powering the battery chargers for continued operation of the battery chargers.
- Providing an alternate source of low pressure reactor pressure vessel (RPV) injection should other sources of high and low pressure injection fail.
- Venting containment using the permanently installed Hardened Containment Vent System (HCVS).

The first two FLEX strategies listed above, powering the battery chargers and providing an alternate source of low pressure RPV injection, are modeled only for Station Blackout (SBO) and Extended Loss of Alternating Current Power (ELAP) sequences with Reactor Core Isolation Cooling (RCIC) initially available and operating for four hours. FLEX strategies are not credited for sequences with no RPV injection at time zero due to insufficient time to perform the alignment.

Diesel Generator 4 (DG-4) or Diesel Generator 5 (DG-5) is used to power the battery chargers. DG-4 is permanently staged in the area where electrical connections exist to connect DG-4 to the 480V electrical bus which is used to power the battery chargers. DG-5 is considered portable FLEX equipment stored onsite and it must be transported to the area where the electrical hookup is performed. Should a loss of all onsite and offsite power occur, the operating crew would utilize DG-4 (preferred) or DG-5 to power the battery chargers. Clear procedural guidance is provided to the operating crew for the startup and electrical connection of the FLEX generators.

One of the FLEX diesel powered pumps, FLEX-P-1 or B.5.b pumper truck, is used to provide an alternate source of low pressure RPV injection. These are redundant pumps which are used as an alternate source of low pressure injection to the RPV when no other source of low pressure injection is available. The FLEX diesel pumps are portable FLEX equipment stored on site and must be transported to the required area, near Service Water pond A or B. Hoses are run from the FLEX pump to the Service Water pond for suction, and from the discharge of the FLEX pump into the reactor building and connected into one of the Residual Heat Removal divisional loops near valves RHR-V-63A/B/C. Clear procedural guidance is provided to the operating crew for the transport, connection, and start of the FLEX diesel powered pumps.

Venting containment using the HCVS uses permanently installed components. The credited equipment is similar to other permanently installed plant components with sufficient plant-specific or generic industry data. The operator actions are similar to other operator actions evaluated using approaches consistent with the endorsed ASME/ANS RA-Sa-2009 PRA standard.

Internal Events PRA Model and Human Error Probabilities (HEPs)

The FLEX strategies were incorporated into the Internal Events PRA model (Revision 8.0) as part of the PRA maintenance process. The incorporation of FLEX strategies into the Internal Events PRA model does not constitute a PRA model upgrade because modeling inclusion of FLEX has been performed in a manner that:

- Is consistent with other modeling aspects used in the PRA model and no new methodology was used.
- Does not result in a change in scope or capability that impacts the significant accident sequences or the significant accident progression.

Therefore, a focused scope peer review was not performed.

Two separate FLEX actions associated with the operation of DG-4 and DG-5 are modeled in the PRA for alignment of each diesel generator:

EACHUMN-DG4-XTIE= 4.72E-01 and EACHUMN-DG5-XTIE= 8.25E-01

However, if the operators fail to successfully align DG-4, the PRA explicitly models that operators will also fail to connect DG-5.

For RPV low pressure injection using the FLEX diesel powered pumps (FLEX-P-1 or B.5.b pumper truck), a single operator action is used to capture the action for starting either pump:

RPVHUMNFLEX-P1= 1.12E-01

These credited FLEX operator actions are evaluated using approaches consistent with the endorsed ASME/ANS RA-Sa-2009 PRA standard and are documented in the Human Reliability Analysis (HRA) notebook.

Seismic PRA Model

The Internal Events PRA model (Revision 8.0) was used to develop the Seismic PRA model. The Seismic PRA model, which includes the FLEX strategies described above, was peer reviewed against the requirements of the Code Case for PRA Standard ASME/ANS RA-Sb-2013 (see LAR Section 3.3).

Fire PRA Model

The Internal Events PRA model (Revision 8.0) was used to develop the Fire PRA model. However, the Fire PRA model only credits DG-4 to power the battery chargers as part of the FLEX strategies to mitigate fire scenarios. DG-5 and the FLEX diesel powered pumps (FLEX-P-1 and B.5.b pumper truck) are not credited in the Fire PRA model. The Fire PRA model, which includes FLEX diesel generator DG-4, was peer reviewed against the requirements of PRA Standard ASME/ANS-RA-Sa-2009 (see LAR Section 3.3).

FLEX Equipment Data

The failure to start and failure to run data for the FLEX equipment was developed using the generic values in NUREG/CR-6928 (Reference 7) for diesel generators and diesel pumps.

Unavailability of the diesel generators and diesel pumps was modeled in the PRA.

Sensitivity Analysis

A sensitivity analysis was performed to measure the risk increase associated with completely removing credit for FLEX strategies from the Internal Events, Fire, and Seismic PRA models. The results of the sensitivity analysis are provided in the following table:

	Delta
Internal Events CDF	1.00E-08
Internal Events LERF	0.00
Fire CDF	4.20E-07
Fire LERF	0.00
Seismic CDF	0.00
Seismic LERF	0.00
Total Delta CDF	**4.30E-07**
Total Delta LERF	**0.00**

4.0 REFERENCES

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines’ (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238)

2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322)

3. ASME Standard ASME/ANS RA-Sa-2009, “Addenda to ASME/ANS RA-S-2008 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications”, dated February 2, 2009

4. Institute of Electrical and Electronics Engineers (IEEE) Standard 279-1968, “Proposed IEEE Criteria for Nuclear Power Plant Protection Systems”, dated August 30, 1968

5. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 2, dated May 2011 (ADAMS Accession No. ML100910006)

6. NRC NUREG/CR-5500, Volume 3, “Reliability Study: General Electric Reactor Protection System, 1984-1995”, dated February 1999

7. NRC NEREG/CR-6928, “Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants, dated February 2007

ENCLOSURE 2

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times
– RITSTF Initiative 4b”

INFORMATION SUPPORTING CONSISTENCY WITH REGULATORY GUIDE 1.200, REVISION 2

Information Supporting Consistency with Regulatory Guide 1.200, Revision 2

1.0 Introduction

Section 4.0, Item 3 of the NRC Final Safety Evaluation (Reference 1) for NEI 06-09-A (Reference 2) requires that the license amendment request (LAR) provide a discussion of the results of peer reviews and self-assessments conducted for the plant-specific Probabilistic Risk Assessment (PRA) models which support the Risk-Informed Completion Time (RICT) program, including the resolution or disposition of any identified deficiencies.

The purpose of this enclosure is to document the technical adequacy of the Columbia Generating Station (CGS) PRA models in support of the LAR to adopt TSTF-505, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b”, Revision 2 (Reference 3).

Specifically, this Enclosure provides a discussion of the results of the peer reviews and self-assessments of the PRA models supporting this application.

2.0 PRA Quality/Technical Adequacy

The PRA models used to support the RICT program have been assessed against Regulatory Guide (RG) 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,” (References 4, 5).

The Internal Events and Seismic PRA models were subject to self-assessment and full scope peer review in accordance with RG 1.200, Revision 2 (Reference 4). The Fire PRA model was subject to a self-assessment and full scope peer review in accordance with RG 1.200, Revision 3 (Reference 5).

RG 1.200, Revision 2, endorsed PRA Standard ASME/ANS RA-Sa-2009 (Reference 6) for preparation of a technically acceptable PRA that can be used to implement risk-informed programs. RG 1.200, Revision 3, was subsequently issued in December 2020. Changes implemented by Revision 3 included:

- Endorsement of NEI 17-07 Revision 2, "Performance of PRA Peer Reviews Using the ASME/ANS PRA Standard"
- Endorsement, with staff exceptions and clarifications, of requirements in ASME/ANS RA-S Case 1, "Case for ASME/ANS RA-Sb-2013 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment of Nuclear Power Plant Applications"
- Endorsement of the requirements for peer review of Newly Developed Methods (NDMs), the process for determining whether a change to a PRA is classified as PRA maintenance or a PRA upgrade, and the definitions related to NDMs, PRA

maintenance, and PRA upgrade from PWROG-19027-NP, Revision 2, "Newly Developed Method Requirements and Peer Review"
- Enhancement of guidance related to key assumptions and sources of uncertainty
- A glossary of key terms
- A list of hazards to be considered in the development and use of PRA

Consequently, the use of RG 1.200, Revision 2, or Revision 3, are acceptable for implementation of the RICT program (Reference 7).

The CGS PRA models are sufficiently robust and suitable for use in risk-informed processes such as regulatory decision-making. The peer reviews that have been conducted and the resolution of findings from those reviews demonstrate that the internal events, internal flooding, fire, and seismic PRA models have been performed in a technically sound manner. The assumptions and approximations used in development of the PRA have also been reviewed and are appropriate for their application. Energy Northwest procedures are in place for controlling and updating the models, when appropriate, and for assuring that the model represents the as-built, as-operated plant.

The CGS PRA models of record are maintained as controlled documents and are updated on a periodic basis to represent the as-built, as-operated plant. Energy Northwest procedures provide the guidance, requirements, and processes for the maintenance, update, and upgrade of the PRA.

2.1 PRA Review Process Results

2.1.1 Internal Events and Internal Flooding PRA Model

The Full Power Internal Events, including internal flood, PRA model was subject to a full scope peer review conducted in August 2009 using the NEI 05-04 process, the ASME PRA Standard (ASME/ANS RA-Sa-2009), and RG 1.200 Revision 2 (Reference 4).

A finding level fact and observation (F&O) independent assessment peer review was performed in March 2018. The purpose of the F&O independent assessment was to review close-out of the F&Os from the August 2009 peer review using Appendix X of NEI 05-04. All F&Os were documented as successfully closed. The March 2018 review included a focused scope peer review of a PRA model upgrade. The upgrade involved a change in time-correlation method from the Accident Sequence Evaluation Program (ASEP) method to the Human Cognitive Reliability/Operator Reliability Experiments (HCR/ORE) method and changes in the dependency analysis.

An F&O independent assessment peer review was performed remotely in May and June 2018. The purpose of the independent assessment was to review close-out of the F&Os from the March 2018 focused scope peer review. All F&Os were documented as successfully closed.

2.1.2 Seismic PRA Model

The Seismic PRA model was peer reviewed in December 2018 using the NEI 12-13 process, the ASME PRA Standard (ASME/ANS RA-Sb-2013, Code Case 1), and RG 1.200, Revision 2 (Reference 4). The peer review was a full-scope review of the CGS at-power Seismic PRA model against all technical elements in ASME/ANS RA-Sb-2013, Code Case 1. The Code Case is an approved alternative to meet the requirements of Part 5 in ASME/ANS RA-Sb-2013 (Reference 9).

An F&O independent assessment peer review was performed in July 2019 to review close-out of F&Os from the December 2018 peer review. All F&Os were documented as successfully closed, except F&O 20-10, which was partially closed. F&O 20-10 was related to site soil characteristics and verification of a site-specific horizontal response spectral shape. The July 2019 review included a focused scope peer review of an upgrade to the Seismic PRA model. The upgrade was a change related to site soil characteristics that recalculated fragilities using a scaling approach which was a method not utilized previously in the model. No F&Os were generated from the focused scope peer review.

A follow up F&O independent assessment peer review was conducted remotely in November 2019 to review close out of F&O 20-10. F&O 20-10 was documented as successfully closed.

A focused scope peer review was conducted in November 2019 to assess the technical adequacy of a Seismic PRA model upgrade. The PRA model upgrade was related to secondary containment modeling of a reactor water clean-up line break to support a Seismic PRA LERF reduction.

An F&O independent assessment peer review was conducted in March 2020 to review close-out of F&Os from the November 2019 focused scope peer review. All F&Os were documented as successfully closed.

2.1.3 Fire PRA Model

The Fire PRA model was subject to a full scope peer review in February 2021. The peer review was conducted in accordance with the NEI 17-07 process, PRA Standard ASME/ANS-RA-Sa-2009, and RG 1.200, Revision 3 (Reference 5).

An F&O independent assessment peer review was conducted in July 2021 to review the close-out of finding level F&Os from the February 2021 peer review. All findings were documented as successfully closed.

2.2 Closure Reviews

Internal Events and Seismic PRA peer review findings were reviewed and closed using the process documented in Appendix X to NEI 05-04, NEI 07-12 and NEI 12-13, “Close-out of Facts and Observations (F&Os)” (Reference 10) as accepted by the NRC in the letter dated May 3, 2017 (Reference 11). Fire PRA model peer review findings were reviewed and closed using the independent assessment guidance in NEI 17-07, Revision 2 (Reference 12), as endorsed by RG 1.200, Revision 3. The independent assessment teams assessing F&O closure assessed each F&O to conclude if the F&O constituted a PRA upgrade or maintenance update.

There are no open items from the CGS RG 1.200 self-assessments or open findings from the peer reviews of the PRA models. The results of the reviews have been documented and are available for NRC audit.

The self-assessment and peer reviews demonstrate that the Internal Events, Fire and Seismic PRA models are of sufficient quality and level of detail to support the RICT program and have been subjected to a peer review process assessed against a standard or set of acceptance criteria that is endorsed by the NRC.

3.0 References

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines’ (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238)
2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322)
3. Letter from the Technical Specification Task Force (TSTF) to the NRC, “TSTF Comments on Draft Safety Evaluation for Traveler TSTF-505, ‘Provide Risk-Informed Extended Completion Times’ and Submittal of TSTF-505, Revision 2”, dated July 2, 2018 (ADAMS Accession No. ML18183A493)
4. NRC Regulatory Guide 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities”, Revision 2, dated March 2009 (ADAMS Accession No. ML090410014)
5. NRC Regulatory Guide 1.200, “Acceptability of Probabilistic Risk Assessment Results for Risk-Informed Activities,” Revision 3, dated December 2020 (ADAMS Accession No. ML20238B871)
6. The American Society of Mechanical Engineers, ASME/ANS RA-Sa-2009, “Addenda to ASME/ANS RA-S-2008, Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,” dated February 2009

7. NRC letter to D.P. Rhoades, Exelon Generation Company, LLC, “LaSalle County Station, Unit Nos. 1 and 2 – Issuance of Amendment Nos. 249 and 235 Related to Application to Adopt 10 CFR 50.69, “Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors” (EPID L-2020-LLA-0017),” dated May 27, 2021 (ADAMS Accession No. ML21082A422)
8. ASME/ANS RA-S Case 1, “Case for ASME/ANS RA-Sb-2013 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,” dated November 2017
9. NRC Letter to R.C. Grantom and R.J. Budnitz, “U.S. Nuclear Regulatory Commission Acceptance of ASME/ANS RA-S Case 1,” dated March 12, 2018
10. NEI letter to NRC, “Final Revision of Appendix X to NEI 05-04/07-12/12-16, Close-Out of Facts and Observations (F&Os),” dated February 21, 2017 (ML17086A431)
11. NRC letter to G. Krueger, Nuclear Energy Institute, “U.S. Nuclear Regulatory Commission Acceptance on Nuclear Energy Institute Appendix X to Guidance 05-04, 07-12, and 12-13, Close-Out of Facts and Observations (F&Os),” dated May 3, 2017 (ML17079A427)
12. NEI 17-07, "Performance of PRA Peer Reviews Using the ASME/ANS PRA Standard,” Revision 2, dated August 2019

ENCLOSURE 3

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b”

INFORMATION SUPPORTING TECHNICAL ADEQUACY OF PRA MODELS WITHOUT PRA STANDARDS ENDORSED BY REGULATORY GUIDE 1.200, REVISION 2

Information Supporting Technical Adequacy of PRA Models without PRA Standards Endorsed by the Nuclear Regulatory Commission

This enclosure is not applicable to the Columbia Generating Station (CGS) submittal. Energy Northwest is only proposing to use PRA models in the CGS Risk-Informed Completion Time Program that were developed in accordance with PRA standards endorsed by the NRC in Regulatory Guide 1.200 Revision 2 or Revision 3.

ENCLOSURE 4

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times
– RITSTF Initiative 4b”

INFORMATION SUPPORTING JUSTIFICATION OF EXCLUDING SOURCES OF RISK NOT ADDRESSED BY THE PRA MODELS

Information Supporting Justification of Excluding Sources of Risk Not Addressed by the PRA Models

1. Introduction and Scope

Topical Report NEI 06-09, Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines", Revision 0-A (hereafter referred to as NEI 06-09-A), (Reference 1), as clarified by the United States Nuclear Regulatory Commission (USNRC) final safety evaluation (Reference 2), requires that the license amendment request (LAR) provide a justification for exclusion of risk sources from the Probabilistic Risk Assessment (PRA) model based on their insignificance to the calculation of configuration risk, and to discuss conservative analyses applied to the configuration risk calculation. This enclosure addresses this requirement by discussing the overall generic methodology to identify and disposition such risk sources and providing the Columbia Generating Station (CGS)-specific results of the application of the generic methodology and the disposition of impacts on the CGS Risk-Informed Completion Time (RICT) program. Section 3 presents the justification for excluding analysis of other external hazards from the CGS PRA.

NEI 06-09-A does not provide a specific list of hazards to be considered in a RICT program. However, non-mandatory Appendix 6-A of the American Society of Mechanical Engineers (ASME) / American Nuclear Society (ANS) RA-Sa-2009 PRA Standard (hereafter "ASME/ANS PRA Standard"), "Addenda to ASME/ANS RA-S-2008 for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear power Plant Applications" (Reference 3) provides a guide for identification of most of the possible external events for a plant site. Additionally, NUREG-1855 Revision 1 (Reference 4) provides a discussion of hazards that should be evaluated to assess uncertainties in plant PRAs and support the risk-informed decision-making process. These hazards were reviewed for CGS, along with a review of information pertaining to the site region and plant design to identify the set of external events to be considered. Information from the CGS Final Safety Analysis Report (FSAR) (Reference 5) pertaining to the geologic, seismologic, hydrologic, and meteorological characteristics of the site region, and the current and projected industrial activities in the plant vicinity was reviewed. No new site-specific or plant-unique external hazards were identified through this review. The list of hazards from Appendix 6-A of the ASME/ANS PRA Standard that were considered for CGS is summarized in Table E4-1.

The scope of this enclosure is consideration of the hazards listed in Table E4-1 for applicability to CGS. Seismic events are explicitly considered and quantified in the CGS PRA model while the other listed external hazards are evaluated and screened as low risk in Section 3.

2. Technical Approach

The guidance contained in NEI 06-09-A states that all hazards that contribute significantly to incremental risk of a configuration must be quantitatively addressed in the implementation of the RICT Program. The following approach focuses on the risk implications of specific external hazards in the determination of the risk management action time (RMAT) and RICT for the Technical Specification (TS) Limiting Conditions for Operation (LCO) selected as part of the RICT Program.

Consistent with NUREG-1855, Revision 1, external hazards may be addressed as follows:

1. Screening the hazard based on a low frequency of occurrence,
2. Conservatively assess the potential impact and including it in the decision-making, or
3. Developing a PRA model to be used in the RMAT/RICT calculation.

The overall process for addressing external hazards considers two aspects of the external hazard contribution to risk.

- The first is the contribution from the occurrence of beyond design basis conditions, e.g., winds greater than design. These beyond design basis conditions challenge the capability of the systems, structures, and components (SSCs) to maintain functionality and support safe shutdown of the plant.
- The second aspect addressed is the challenges caused by external conditions that are within the design basis, but still require some plant response to assure safe shutdown (e.g., high winds causing loss of offsite power, etc.). While the plant design basis assures that the safety-related equipment necessary to respond to these challenges are protected, the occurrence of these conditions nevertheless cause a demand on these systems that in and of itself presents a risk.

Hazard Screening

The first step in the evaluation of the external hazard is screening based on an estimation of a conservative core damage frequency (CDF) for beyond design basis hazard conditions. An example of this type of screening is reliance on the USNRC's 1975 Standard Review Plan (SRP) (Reference 6) which is acknowledged in the USNRC's Individual Plant Examination of External Events (IPEEE) procedural guidance (Reference 7) as assuring a conservative CDF of less than 1E-06 per year for each hazard. The conservative CDF estimate is often characterized by the likelihood of the site being exposed to conditions that are beyond the design basis limits and an estimate of the conservative conditional core damage probability (CCDP) for those conditions. If the conservative CDF for the hazard can be shown to be less than 1E-06 per year, then beyond design basis challenges from the hazard can be screened and do not need to be addressed quantitatively in the RICT Program. The basis for this is as follows:

- The overall calculation of the RICT is limited to an incremental core damage probability (ICDP) of 1E-05.
- The maximum time interval allowed for the RICT is 30 days.
- If the maximum CDF contribution from a hazard is <1E-06 per year, then the maximum ICDP from the hazard is <1E-07 (1E-06/year * 30 days/365 days/year).
- Thus, the conservative ICDP contribution from the hazard is shown to be less than 1% of the permissible ICDP in the conservative time for the condition. Such a minimal contribution is not significant to the decision in computing a RICT.

The CGS hazard screening analysis from the IPEEE has been updated to reflect current site conditions. The results are discussed in Section 3 and show that all events listed in Table E4-1 can be screened for CGS.

While the direct CDF contribution from beyond design basis hazard conditions can be shown to be insignificant using this approach, some external hazards can cause a plant challenge even for hazard severities that are less than the design basis limit. These considerations are addressed in Section 3.

3. Evaluation of External Event Challenges and IPEEE Update Results

The primary purpose of this section is to address the incremental risk associated with challenges to the facility that do not exceed the design capacity. This section also provides the results of the hazard screening described earlier. Table E4-1 lists the external hazards considered.

Hazard Screening

The CGS IPEEE provides an assessment of the risk to the CGS associated with external hazards. Additional analyses have been done since the IPEEE to provide updated risk assessments of various hazards, such as aircraft impacts, industrial facilities and pipelines, and external flooding.

Table E4-1 reviews the bases for the evaluation of these hazards, identifies any challenges posed, and identifies any additional treatment of these challenges, if required. Table E4-2 provides the criteria applied in the progressive screening process used in this assessment. The conclusions of the assessment, as documented in Table E4-1, assure that the hazard either does not present a design-basis challenge to CGS, or is adequately addressed in the PRA.

External hazards other than seismic can be screened for the CGS site.

In the application of RICTs, a significant consideration in the screening of external hazards is whether particular plant configurations could impact the decision on whether a particular hazard that screens under the normal plant configuration and the base risk profile would still screen given the particular configuration. The external hazards screening evaluation for CGS has been performed accounting for such configuration-specific impacts. The process involves multiple steps.

As a first step in this screening process, hazards that screen for one or more of the following criteria (as defined in Table E4-2) still screen regardless of the configuration, as these criteria are not dependent on the plant configuration.

- The occurrence of the event is of sufficiently low frequency that its impact on plant risk does not appreciably impact CDF or LERF. (Criterion C2)
- The event cannot occur close enough to the plant to affect it. (Criterion C3)
- The event which subsumes the external hazard is still applicable and bounds the hazard for other configurations (Criterion C4)
- The event develops slowly, allowing adequate time to eliminate or mitigate the hazard or its impact on the plant. (Criterion C5)

The next step in the screening process is to consider the remaining hazards (i.e., those not screened per the above criteria) to consider the impact of the hazard on the plant given particular configurations for which a RICT is allowed. For hazards for which the ability to achieve safe shutdown may be impacted by one or more such plant configurations, the impact of the hazard to particular SSCs is assessed and a basis for the screening decision applicable to configurations impacting those SSCs is provided.

As noted above, the configurations to be evaluated are those involving unavailable SSCs whose LCOs are included in the RICT program.

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
Aircraft Impact	Y	PS4	The IPEEE external hazard evaluation was performed in 1995. An updated evaluation regarding aircraft impact was performed as part of the Re-Examination of External Events Evaluation in the IPEEE in 2017. Section R.1 of the evaluation demonstrated that aircraft impact and skid frequencies remain less than 1E-07/yr.
Avalanche	Y	C3	Plant site is not located near large mountains where snow avalanches are prevalent. CGS is located in the middle of a plain with minimal variations in height across topography.

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion$^{(a)}$	Disposition for RICT
Biological Event	Y	C1 C5	Hazard is slow to develop and can be identified via monitoring and managed via standard maintenance process. Actions committed to and completed by CGS in response to Generic Letter 89-13 (Reference 8) provide ongoing control of biological hazards. These controls are described in the Service Water Reliability Program. In addition, station actions taken in response to INPO SOER 07-2 provide an additional layer of biological hazard management.
Coastal Erosion	Y	C3	Not applicable to the site because of location.
Drought	Y	C5	Drought is a slowly developing hazard. The plant location (riverine site with seven dams upstream and four dams downstream) precludes the impact on the plant due to this hazard. The river surface water level near CGS is primarily controlled by regulation of the 35 million acre-feet capacity of upstream reservoir projects.
External Flooding and Intense Precipitation	Y	C1	The external flooding hazard at the site was recently updated as a result of the post-Fukushima 50.54(f) Request for Information and the flood hazard reevaluation report (FHRR) which was submitted to NRC for review on October 6, 2016 (Reference 9). The results indicate that flooding from rivers and streams (precipitation based) and dam failure; and the combined effect for dam failure with coincident wind-wave activity, do not pose a challenge to the plant below the mean sea level (MSL) critical elevation at CGS. Natural topography maintains natural drainage away from the site. To provide adequate surface drainage during severe precipitation conditions,

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			such as heavy rainfall and fast snowmelts (local intense precipitation events), a system of catch basins and dry wells is constructed with inlet elevations lower than the finished floor elevation of the nearest building(s). The roofs of safety-related buildings are designed to handle local intense precipitation events with adequate drainage.
Extreme Wind or Tornado	Y	C1 PS4	The design basis tornado maximum wind speed is 200 mph. The atmospheric pressure at the center of the tornado is 0.9 psi below ambient. The 0.9 psi external pressure drop is assumed to occur at a rate of 0.3 psi/sec. Per Table 6-1 of NUREG/CR-4461 (Reference 11), the 1E-7 probability tornado wind speed is 210 mph, based on the F-scale, and 167 mph, based on the more recent EF-scale. CGS calculated the probability of a design basis tornado striking CGS to be 9.6E-7. Sections 3.3 and 3.5.2 of the CGS FSAR (Reference 5) describe the capability of SSCs to withstand wind and tornado loadings to include missile protection for SSCs required to bring the plant to a safe shutdown condition. All the SSCs are protected from external missiles by passive permanent barrier structures or redundant systems.
Fog	Y	C1	The principal effects of such events would be to cause a loss of offsite power (LOOP) and are addressed in the weather-related LOOP initiating events in the internal events PRA model for CGS.

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
Forest or Range Fire	Y	C1 C4	The most significant consequence of a forest or range fire is a LOOP which is evaluated in the internal events PRA model. There are no major wooded areas close enough to the site to pose a significant fire hazard. Areas adjacent to CGS, major buildings, and auxiliary facilities are maintained to prevent weed growth by landscaping, ground cover, and weed control spraying to help reduce the likelihood of brush fires. FSAR (Reference 5) Section 3.1.2.2.10 confirms that the control room ventilation is established by recirculating air through HEPA filters in the event of excessive smoke in the air near the normal control room ventilation intake
Frost	Y	C1 C4	The principal effects of such events would be to cause a LOOP and are addressed in the weather-related LOOP initiating events in the Internal Events PRA model for CGS.
Hail	Y	C1 C4	The principal effects of such events would be to cause a LOOP and are addressed in the weather-related LOOP initiating events in the Internal Events PRA model for CGS.
High Summer Temperature	Y	C1 C5	High summer temperatures are of negligible impact on the site. This phenomenon provides a large amount of time for preparation (weather forecast) with time for implementation of appropriate mitigation actions.
High Tide, Lake Level, or River Stage	Y	C1 C3 C4	High tide or lake level are not applicable to the site because of location. Impact of high river stage is slow to develop with time for implementation of appropriate mitigation actions. See also “External Flooding”.

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
Hurricane	Y	C3	The Pacific Northwest location of the CGS site precludes the possibility of a hurricane.
Ice Cover	Y	C1 C4	There have been on average seven "glaze days" per year where glaze refers to a clear coating of ice containing some air pockets. Two instances of severe traffic disruption have occurred but there has been no known damage to transmission lines due to ice. Ice flooding will not affect the capability to shut down the reactor in a safe and orderly manner. The maximum water surface elevation due to ice induced flooding is bounded by other flood causing mechanisms. Also, the daily fluctuating stage of the river at the intake location will discourage formation of sheet ice as well as ice jams. Ice flows, should they occur, will normally pass over the intake structure due to relatively high winter discharge in the river. Therefore, the principal effects of ice cover would be to cause a LOOP and are addressed in the weather-related LOOP initiating events in the Internal Events PRA model for CGS.
Industrial or Military Facility Accident	Y	PS2 PS4	There are no military facilities within the proximity to the plant site. Industrial facilities within 5 miles of the plant were screened from further evaluation as they do not pose a challenge to the safe operation of the plant due to frequency of occurrence. The Energy Northwest Hydrogen Storage and Supply Facility is located 0.6 miles from the site. An analysis (FSAR Chapter 3 and Appendix F) (Reference 5) shows that an explosion

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			and subsequent missile generation from a random tank rupture at normal pressure would not affect the plant due to the remote distance of the facility. A second analysis shows that an overpressurization event and subsequent rupture is a credible event; however, the total annual probability for any missiles generated is less than 10^{-7} and the storage containers have relief valves for overpressurization. Therefore, the hydrogen storage facility does not pose a challenge to the plant.
Internal Fire	N	None	The CGS Fire PRA model includes evaluation of risk from internal fires.
Internal Flooding	N	None	The CGS Internal Events PRA model includes evaluation of risk from internal flooding events.
Landslide	Y	C3	The plant site is located on level terrain and is not subject to landslides.
Lightning	Y	C1 C4	The principal effect of such events would be to cause a LOOP which is addressed in the weather-related LOOP initiating events in the Internal Events PRA model for CGS.
Low Lake Level or River Stage	Y	C5	Low lake level is not applicable to the site because of location. Impacts of low river stage are slow to develop with time for implementation of appropriate mitigation actions (e.g., plant power reduction or shutdown).
Low Winter Temperature	Y	C1 C5	Low winter temperatures are of negligible impact on the site. This phenomenon provides a large amount of time for preparation (weather forecast) with time for implementation of appropriate mitigation actions (e.g., plant power reduction or shutdown).
Meteorite or Satellite Impact	Y	PS4	The possibility of plant damage from water damage from a meteorite and

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			subsequent tsunami is not credible based on the site location. The sum of meteor land impacts and air burst impacts frequencies is 4.7E-08/yr.
Pipeline Accident	Y	C3	There are no challenges presented to CGS as a result of pipeline accidents. There are no pipelines in the vicinity of CGS as the two closest pipelines are natural gas pipelines at distances of 12 and 24 miles from the site. See "Industrial or Military Facility Accident" for discussion of the Energy Northwest Hydrogen Storage and Supply Facility.
Release of Chemicals from On-site storage	Y	C4 PS1	In accordance with the Control Room Envelope Habitability Program, hazardous chemical evaluations have been performed for all of the chemicals stored onsite. The impact of releases of chemicals in onsite storage do not pose a risk to the site. Chemicals on the CGS site were analyzed in accordance with the guidance provided in RG 1.78 (Reference 12). Most of the chemicals screened out due to being small quantities in small containers, whereas the rest of the chemicals were analyzed assuming the maximum control room intake (1300 cfm in two train pressurization mode) is unfiltered. The results showed that all the chemicals were well below the toxicity limits. Therefore, none of the chemicals pose a threat to control room operators at CGS. See also “Transportation Accidents.”
River Diversion	Y	C3	Columbia River flow is controlled by the operation of upstream reservoirs by the U.S. Army Corps of Engineers (USACE). There is no historical or topographical

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			evidence indicating that flow in the Columbia River can be diverted from its present course. The river is wide and well defined, and there are no deeply incised gorges upstream that could cause a landslide that would cut off river flow. Therefore, it is very unlikely that the Columbia River would be diverted from its present course by natural causes.
Sand or Dust Storm	Y	C1 C4	Sand or dust storm is bounded by a postulated volcanic ash event. See also “Volcanic Activity.”
Seiche	Y	C1 C3	Flooding due to seiches is not relevant for CGS per FSAR Section 2.4.11.2 (Reference 5).
Seismic Activity	N	None	The CGS Seismic PRA model includes evaluation of risk from seismic activity.
Snow	Y	C1 C4	The principal effect of snow events would be to cause a LOOP which is addressed in the weather-related LOOP initiating events in the Internal Events PRA model for CGS. FSAR (Reference 5) Section 2.3.1.2.2 states the following: ANSI value of 20 lb/ft^2 was used as the design load for all CGS structures, which corresponds to a depth of 3.2 feet. The largest 24-hour snowfall was 10.2 inches in February 1993 and a record depth of approximately 12 inches lasted four days in December 1964. These depths would correspond to snow loads of 5.3 and 6.24 lb/ft^2 respectively. Based upon the above information, the design of the CGS structures is able to withstand any postulated snow load. The effects of the snowfall (as opposed to the snow load following the

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion$^{(a)}$	Disposition for RICT
			precipitation) is addressed by the weather-centered LOOP initiator in the internal events PRA model; no other treatment is necessary for risk-informed regulatory applications.
Soil Shrink-Swell Consolidation	Y	C1 C5	The existing loose to medium dense sand was excavated down to the underlying very dense Ringold gravel beneath all Seismic Category I structures and replaced with a denser state by compaction. Therefore, the potential for this hazard is low at the site. The plant design considers this hazard and the hazard is slow to develop and can be mitigated.
Storm Surge	Y	C3	Given the inland location and no connections with any water bodies considered for meteorological events associated with a storm surge, flooding due to a storm surge is not plausible at CGS.
Toxic Gas	Y	C4	In accordance with the Control Room Envelope Habitability Program, hazardous chemical evaluations have been performed for all of the chemicals stored onsite and for those chemicals that exist within a 5-mile radius from the plant or transported using roads around the plant. The hazards associated with toxic gas are screened elsewhere in this table (e.g., Release of Chemicals in Onsite Storage, Industrial or Military Facility Accident, and Transportation Accident).
Transportation Accidents	Y	C3 C4 PS2 PS4	Water Transportation: The Columbia River is not used for barge traffic in the vicinity of the plant site as the river channel is too shallow and the current is too swift.

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			Rail Transportation: The Department of Energy (DOE) Hanford Site railroad system connects with commercial rail systems in Richland and Kennewick, Washington. Railroad operations that pass through the CGS property are restricted to only those trains that have been authorized by Energy Northwest Security. The rail line is physically blocked at the two points where the plant vehicle barrier crosses the tracks (FSAR Section 2.2.1). DOE shipments of large quantities of hazardous materials within the exclusion area of the plant site during initial licensing of CGS are no longer made (FSAR (Reference 5) Section 2.2.2.2). Land Transportation: CGS is serviced by a paved access road connected to the DOE roadway system. State Highway 240 comes within 7 miles of CGS at its closest point. Chemical hazards stored and transported in the vicinity of the plant were analyzed in FSAR Section 2.2.3(Reference 5). The analysis concluded that toxic chemicals transported or stored within the vicinity of the plant do not pose a threat to the plant.
Tsunami	Y	C3	Not applicable to the site because of location.
Turbine-Generated Missiles	Y	PS2 PS4	The probability of damage to safety-related systems by turbine missiles is acceptably low, due to (a) the protection provided by reinforced-concrete structural barriers, (b) the calculated probability of turbine missile generation, and (c) periodic testing and inspection of

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			turbine overspeed protection systems with associated corrective action as required. The highest overall damage probability for postulated turbine-generated missiles is less than or equal to $1x10^{-7}$ per year (Reference 5).
Volcanic Activity	Y	C1	Due to the distance of CGS from the two major volcanoes (Mt. Adams,165 km, and Mt. St. Helens, 220 km), only ash fall poses a hazard as mud flows, avalanches, pyroclastic rock flows, lava flows and shock waves are confined to a volcano's immediate area. Enhancements to seismic monitoring capability over the past decade, as well as ash fall monitoring by the Volcanic Ash Advisory Center (VAAC) over the past several decades, improved the timeliness and detail of information available to CGS, in advance of potential ash fall. Therefore, there is adequate time to take mitigating actions (e.g., plant power reductions or shutdown). The CGS "Ash Fall" procedure includes six attachments that detail procedural steps and timing required to perform filter replacements. It includes direction to change FLEX component original equipment manufacturer (OEM) filters to ensure that in the event of a Station Blackout/Extended Loss of Alternating Current Power (SBO/ELAP) event the related FLEX components are maintained available. Therefore, there is adequate time to take mitigating actions

Table E4-1: Evaluation of Risks from External Hazards

External Hazard	Screened Out? (Y/N)	Screening Criterion[(a)]	Disposition for RICT
			(e.g., plant power reductions or shutdown).
Waves	Y	C3 C4	Waves associated with adjacent large bodies of water are not applicable to the site. Waves associated with external flooding are covered under that hazard.

Note (a): See Table E4-2 for descriptions of screening criteria.

Table E4-2: Progressive Screening Approach for Addressing External Hazards

Event Analysis	Criterion	Source	Comments
Initial Preliminary Screening	C1. Event damage potential is less than events for which plant is designed.	NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009	
	C2. Event has lower mean frequency and no worse consequences than other events analyzed.	NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009	
	C3. Event cannot occur close enough to the plant to affect it.	NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009	
	C4. Event is included in the definition of another event.	NUREG/CR-2300 and ASME/ANS Standard RA-Sa-2009	Not used to screen. Used only to include within another event.
	C5. Event develops slowly, allowing adequate time to eliminate or mitigate the threat.	ASME/ANS Standard RA-Sa-2009	
Progressive Screening	PS1. Design basis hazard cannot cause a core damage accident.	ASME/ANS Standard RA-Sa-2009	
	PS2. Design basis for the event meets the criteria in the NRC 1975 Standard Review Plan (SRP) (Reference 6).	NUREG-1407 and ASME/ANS Standard RA-Sa-2009	
	PS3. Design basis event mean frequency is < 1E-05 per year and the mean conditional core damage probability is < 0.1.	NUREG-1407 as modified in ASME/ANS Standard RA-Sa-2009	
	PS4. Bounding mean CDF is < 1E-06 per year.	NUREG-1407 and ASME/ANS Standard RA-Sa-2009	
Detailed PRA	Screening not successful. PRA needs to meet requirements in the ASME/ ANS PRA Standard.	NUREG-1407 and ASME/ANS Standard RA-Sa-2009	

4. Conclusions

Based on this analysis of external hazards for CGS, no additional external hazards need to be added to the existing PRA models. The evaluation concluded that the hazards either do not present a design-basis challenge to CGS, the challenge is adequately addressed in the PRA (including the models for internal flooding, internal fires and seismic events), or the hazard has a negligible impact on the calculated RICT and can be excluded.

The ICDP/ILERP acceptance criteria of 1E-05/1E-06 will be used within the RICT Program framework to calculate the resulting RICT and RMAT based on the total configuration-specific delta CDF/LERF attributed to internal events, fire, and seismic events.

5. References

1. Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, "Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines", Revision 0-A, dated October 12, 2012 (ADAMS Accession No. ML12286A322 (part of ADAMS Package Accession No. ML122860402)).
2. Letter from Jennifer M. Golder (NRR) to Biff Bradley (NEI), "Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, “Risk-Informed Technical Specifications Initiative 4B, Risk-Managed Technical Specifications (RMTS) Guidelines (TAC No. MD4995),” dated May 17, 2007 (ADAMS Accession No. ML071200238).
3. ASME/ANS RA-Sa-2009, “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,” Addendum A to RAS-2008, ASME, New York, NY, American Nuclear Society, La Grange Park, Illinois, February 2009.
4. NUREG-1855, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making”, Revision 1, March 2017.
5. “Columbia Generating Station Final Safety Analysis Report (FSAR),” Amendment 66, Energy Northwest, December 2020.
6. NUREG-75/087, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, LWR Edition”, 1975.
7. NUREG-1407, “Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities”, June 1991.
8. “Nuclear Power Plant No. 2, Operating License NPF-21 Response to Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment,” GO2-90-017, Washington Public Power, February 5, 1990.

9. Energy Northwest letter to the NRC, "Flooding Hazard Reevaluation Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated October 6, 2016 (ADAMS Accession No. ML 16286A309).
10. NUREG/CR-2300, “PRA Procedures Guide: A Guide to the Performance of Probabilistic Risk Assessments for Nuclear Power Plants,” January 1983.
11. NUREG/CR-4461, “Tornado Climatology of the Contiguous United States”, Revision 2, February 2007.
12. Regulatory Guide 1.78, “Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release”, Revision 1, December 2001.

ENCLOSURE 5

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b”

BASELINE CDF AND LERF

Baseline CDF and LERF

1.0 Introduction

Section 4.0, Item 6 of the NRC Final Safety Evaluation (Reference 1) for NEI 06-09-A, Revision 0, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines” (Reference 2), requires that the license amendment request (LAR) provide the plant-specific total core damage frequency (CDF) and total large early release frequency (LERF) to confirm that these values are within the guidelines established in Regulatory Guide (RG) 1.174, Revision 1 (Reference 3). Note that RG 1.174, Revision 2 (Reference 4) and RG 1.174, Revision 3 (Reference 5) did not revise these guidelines.

The purpose of this enclosure is to demonstrate that the Columbia Generating Station (CGS) total CDF and total LERF are within the guidelines established in RG 1.174, which does not establish firm limits for total CDF and LERF, but recommends that risk-informed applications be implemented only when the total plant risk is no more than about 1E-4/year for CDF and 1E-5/year for LERF. Demonstrating that these guidelines are met confirms that the risk metrics of NEI-06-09-A can be applied to the Risk Informed Completion Time (RICT) Program.

2.0 Baseline Risk

Baseline risks are documented in Energy Northwest’s quantification calculation/notebooks for each hazard. Baseline risk, in these calculations, are quantified using nominal maintenance. For the purposes of this LAR, these nominal-maintenance results are utilized as a bounding representation of CDF and LERF. Note that for RICT Program implementation, the application specific model will be a no-maintenance model since the actual configuration of the plant will be known; the plant configuration will be replicated within the configuration risk management software and then quantified to produce a RICT.

The baseline results from the CGS PRA models are provided in Table E5-1.

Table E5-1
Total Baseline CDF/LERF

CGS Baseline CDF	
Source	**Contribution**
Internal Events PRA (with Internal Flooding)	2.36E-06
Fire PRA	4.06E-05
Seismic PRA	1.73E-05
Other External Events	No significant contribution
Total CDF	6.03E-05

CGS Baseline LERF	
Source	**Contribution**
Internal Events PRA (with Internal Flooding)	1.60E-07
Fire PRA	3.34E-06
Seismic PRA	5.16E-06
Other External Events	No significant contribution
Total LERF	8.66E-06

As demonstrated in Table E5-1, the total CDF and total LERF are within the guidelines set forth in RG 1.174 and support small changes in risk that may occur during RICT entries following TSTF-505 implementation. Therefore, CGS TSTF-505 implementation is consistent with NEI 06-09-A guidance.

3.0 References

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines’ (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238)
2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322)
3. Regulatory Guide 1.174, "An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 1, November 2002 (ADAMS Accession No. ML023240437)
4. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 2, dated May 2011 (ADAMS Accession No. ML100910006)
5. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 3, dated January 2018 (ADAMS Accession No. ML17317A256)

ENCLOSURE 6

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times
– RITSTF Initiative 4b"

JUSTIFICATION OF APPLICATION OF AT-POWER PRA MODELS TO SHUTDOWN MODES

Justification of Application of At-Power PRA Models to Shutdown Modes

This enclosure is not applicable to the Columbia Generating Station submittal. Energy Northwest is proposing to only apply the Risk-Informed Completion Time Program in Modes 1 and 2.

ENCLOSURE 7

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b”

PRA MODEL UPDATE PROCESS

PRA Model Update Process

1.0 Introduction

Section 4.0, Item 8 of the NRC Final Safety Evaluation (Reference 1) for NEI 06-09-A, Revision 0, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines,” (Reference 2) requires that the license amendment request (LAR) provide a discussion of the licensee’s programs and procedures which assure the PRA models supporting the RMTS are maintained consistent with the as-built/as-operated plant. Energy Northwest utilizes a formal process to maintain and update the Probabilistic Risk Assessment (PRA) models such that these models reflect the as-built, as-operated plant. Energy Northwest maintains a PRA model of record that will be used as the basis for the Risk-Informed Completion Time (RICT) program at the Columbia Generating Station.

This enclosure describes the administrative controls and procedural processes that will be used to ensure the configuration control of the PRA models used to support the RICT Program. Plant changes, including physical modifications and design changes, will be identified, and reviewed prior to implementation to determine if they could impact the PRA models per the Energy Northwest configuration control procedure. The PRA model update process will ensure these plant changes are incorporated into the PRA models as appropriate. The process will also include monitoring and evaluation of discovered conditions that may impact the PRA models (including potential or known errors); issues that are determined to be conditions adverse to quality will be entered into the station’s corrective action program.

Should a plant change or a discovered condition be identified that has a significant impact to the RICT Program calculations, as defined by procedure, an unscheduled update to the PRA model will be implemented. Otherwise, the change will be incorporated during the next periodic update of the PRA model. Such pending changes are considered when evaluating other changes until they are fully implemented into the PRA models. Periodic updates will be performed every two fuel cycles. Also, reviews of outstanding issues, changes, or errors will be conducted to ensure the application specific model is adequate to continue supporting the RICT program.

2.0 PRA Model Update Process

2.1 Internal Events, Internal Flood, Seismic, and Fire PRA Model Maintenance and Update

The Energy Northwest PRA configuration control process will ensure that the applicable PRA model of record and application-specific models used for the RICT Program reflects the as-built, as-operated plant for Columbia Generating Station. Energy

Northwest procedure SYS-4-34 will describe the responsibilities and provide guidance and requirements for controlling and updating the at-power internal events including internal flooding, fire, and seismic PRA models for periodic and unscheduled updates.

The process will include provisions to:

- track, evaluate, and prioritize issues that may affect the technical elements of the PRA models (e.g., due to plant changes, plant/industry operational experience, or errors or limitations identified in the model);
- assess the individual and cumulative risk impact of unincorporated changes; and
- control the model and necessary computer files, including those associated with the Configuration Risk Management (CRM) model.

Changes that are considered an upgrade per the PRA standard (ASME/ANS RA-Sa-2009, as endorsed by RG 1.200, Revision 2) will receive a peer review focused on those aspects of the PRA model that represent the upgrade.

2.2 Review of Plant Changes for Incorporation into the PRA Model

1. Energy Northwest utilizes a database to identify and track all PRA model changes including physical modifications to the facility and to operating practices and procedures. Changes with potential significant risk impact are also tracked using the change database, but they may also be entered into the corrective action program (if the issue rises to the level of a condition adverse to quality).

2. Plant changes or discovered conditions are captured in the change database and reviewed to determine the potential impacts to the PRA models including the CRM model and the subsequent risk calculations that support the RICT Program (NEI 06-09-A, Section 2.3.4, Items 7.2 and 7.3, and Section 2.3.5, Items 9.2 and 9.3).

3. Plant changes will be evaluated and screened based on risk criteria consistent with procedural requirements with consideration of the cumulative impact of other pending changes. Database entries with the potential for significant impact to the CRM tool used for performing RICT calculations will be incorporated as an unscheduled update. The timeliness of the unscheduled update will be commensurate with the significance of the issue(s).

   Energy Northwest will use a living model concept for evaluating outstanding issues that could impact the PRA. The impact on the RICT program will be reviewed no later than every four months by assembling and quantifying the latest living model files. If planned changes or errors have a significant impact to the PRA model, which is defined as greater than +/-25% for core damage frequency (CDF) or large early release frequency (LERF), or significant impacts to basic event importance measures used for RICT calculations, then an unscheduled update will occur to update the model of record and/or application specific model, as appropriate.

If the +/-25% for CDF or LERF criteria is exceeded, then use of the RICT program is suspended until the issue can be addressed, except when the deviation is such that impacted RICTs remain conservative. The PRA engineer may also perform and document a standalone, interim analysis that justifies continued use of the RICT program if the results of the analysis bound the issue documented in the change database. For example, the interim analysis could involve additional PRA refinement to model the system and/or issue in greater detail. This interim analysis is also discussed in item 6 of this section. The station will continue to move forward with an unscheduled PRA update if the +/- 25% CDF or LERF criteria is exceeded regardless of whether interim analyses justify continued use of the RICT program (i.e., interim analyses do not allow deferring an unscheduled PRA update when the criteria is exceeded, but these analyses can defend continued use of the program while the unscheduled PRA update is being implemented).

If it is not practical to assess the impact quantitatively, then a qualitative assessment, utilizing the experience and judgment of the PRA engineer, is performed considering the potential change in basic event importance measures for each application. This assessment utilizes the experience and judgment of the PRA engineer to determine if there are any issues that are individually negligible but could collectively impact the RICT program.

4. Otherwise, the change will be assigned a priority and will be incorporated during the routine, periodic update consistent with procedural requirements.

5. PRA model of record updates will be performed once every two fuel cycles but may be completed sooner depending on the changes or issues documented in the change database and at the discretion of management.

6. If a PRA model change is required for the CRM model, but cannot be immediately implemented for a significant plant change or discovered condition, either one of the following is applied:

    a. Analysis to address the expected risk impact of the change will be performed. In such a case, these interim analyses become part of the RICT Program calculation process until the plant changes are incorporated into the PRA model during the next update. The use of such bounding analyses is consistent with the guidance of NEI 06-09-A.

    OR

    b. Appropriate administrative restrictions on the use of the RICT program for extended Completion Time are put in place until the model changes are completed, consistent with the guidance of NEI 06-09-A.

These actions satisfy NEI 06-09-A, Section 2.3.5, Item 9.3.

3.0 References

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238).

2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322).

ENCLOSURE 8

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b”

ATTRIBUTES OF THE REAL-TIME MODEL

Attributes of the Real-Time Model

1.0 Introduction

Section 4.0, Item 9 of the NRC Final Safety Evaluation (Reference 1) for NEI 06-09-A, Revision 0, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0 (Reference 2), requires that the license amendment request (LAR) provide a description of the probabilistic risk assessment (PRA) models and tools used to support the RMTS. This includes identification of how the baseline probabilistic risk assessment (PRA) model will be modified for use in the Configuration Risk Management (CRM) tools, quality requirements applied to the PRA models and CRM tools, consistency of calculated results from the PRA and CRM model, and training and qualification programs applicable to personnel responsible for development and use of the CRM tools. This item should also confirm that the RICT Program tools can be readily applied for each Technical Specification (TS) Limiting Conditions for Operation (LCO) within the scope of the plant-specific submittal. This enclosure describes the necessary changes to the peer-reviewed baseline PRA models for use in the Configuration Risk Management Program (CRMP) software to support the Risk-Informed Completion Time (RICT) Program. The process that will be employed to adapt the baseline models is demonstrated:

a) to preserve the core damage frequency (CDF) and large early release frequency (LERF) quantitative results;
b) to maintain the quality of the peer-reviewed PRA models; and
c) to correctly accommodate changes in risk due to configuration-specific consideration.

Quality controls and training programs applicable to the RICT Program are also discussed in this enclosure.

2.0 Translation of Baseline Model for Use in Configuration Risk

The baseline PRA models for internal events, including internal flood, internal fire, and seismic are peer-reviewed models. These models are updated when necessary to incorporate plant changes to reflect the as-built/as-operate plant as discussed in Enclosure 7. The application specific model used for the RICT program will be a zero-maintenance model capable of calculating the internal events (including internal flooding), seismic, and fire risk for each plant configuration. The RICT program model will be verified to provide results equivalent to the baseline models in accordance with approved procedures.

The CRM software will be used to facilitate all configuration-specific risk calculations and support RICT Program Implementation. The baseline PRA models are modified to create a CRM-specific model as follows:

- The unit availability factor is set to 1.0 (unit available).
- Maintenance unavailability is set to zero/false unless unavailable due to the configuration.
- Mutually exclusive combinations, including normally disallowed maintenance combinations, are adjusted to allow accurate analysis of the configuration.
- For systems where some trains are in service and some in standby, the CRM model will address the configurations of the plant in a manner to include defining in-service trains and alignments as needed.

The CRM software is designed to quantify the configuration for internal events, including internal flooding and fire, and seismic risk contribution when calculating the risk management action time (RMAT) and RICT.

The treatment of common cause failure (CCF) will be in accordance with the approach described in NEI 06-09. For planned RICTs (e.g., to perform preventive maintenance tasks), no changes in CCF factors would be made in the CRM model since no failures have occurred and adjustment of CCF groups to account for the out-of-service component would result in a net reduction in the total CCF probability for the remaining in-service components. For emergent failures, Operations personnel would perform an extent of condition evaluation (using existing plant processes) to determine if any CCF potential exists. If CCF cannot be ruled out and the potential exists for a loss of function, then RICT would not apply. If the potential CCF is determined to not result in a loss of function, then a quantitative or qualitative evaluation of the impact on the RICT would be performed. If a quantitative evaluation of increased CCF probability is performed, the adjustment to CCF probability will be made in accordance with Regulatory Guide 1.177, “Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications”, Revision 2 (Reference 3). If a qualitative evaluation is performed, Risk Management Actions to manage a possible common cause failure would be considered for implementation.

3.0 Quality Requirement and Consistency of PRA Model and Configuration Risk Management Tools

The approach for establishing and maintaining the quality of the PRA models, including the CRM model, includes both a PRA maintenance and update process (described in Enclosure 7), and the use of self-assessments and independent peer review (described in Enclosure 2).

The information provided in Enclosure 2 demonstrates that the Columbia Generating Station internal events (including internal flooding), internal fire, and seismic PRA models reasonably conform to the associated industry standards endorsed by

Regulatory Guide (RG) 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities”, Revision 2 (Reference 4). This information provides a robust basis for concluding that the PRA models are of sufficient quality for use in risk-informed licensing actions.

For maintenance of an existing CRM model, changes made to the baseline PRA model in translation to the CRM model will be controlled and documented in accordance with Energy Northwest’s PRA configuration control procedure. The configuration control process includes identification, evaluation, and corrective action related to model errors and plant changes. The process will ensure models are accurate, as described in Enclosure 7. Because the CRM model is developed from the complete baseline PRA models (i.e., it is not a simplified model), the results of this model would be expected to be essentially identical to those of the constituent baseline PRA models for internal events, internal flooding, internal fire, and seismic hazards (after accounting for the items in Section 2.0 such as setting maintenance events to zero, unit availability factor to 1.0, etc.). Acceptance testing is performed after every CRM model update to ensure that the software functions as intended and that quantification results are reasonable. The CRM model is typically updated to reflect the as-built, as-operated plant once every two fuel cycles.

These actions satisfy NEI 06-09-A, Section 2.3.5, Item 9.

4.0 Training and Qualification

The PRA staff is responsible for development and maintenance of the CRM model. Operations and Work Control staff will use the configuration risk tool to implement the RICT Program. The PRA and Operations staff are trained in accordance with a program using National Academy for Nuclear Training ACAD documents, which is also accredited by Institute of Nuclear Power Operations (INPO).

5.0 Application of the Configuration Risk Tool to the RICT Program Scope

Columbia Generating Station will utilize an application specific model to facilitate configuration-specific risk calculations and support the RICT Program implementation. The software will be specifically designed to support the implementation of RMTS and will permit the user to evaluate all plant configurations using appropriate mapping of plant equipment to the PRA basic events. The equipment in the scope of the RICT program will be able to be evaluated in the appropriate PRA models. The configuration risk management software implementation will conform to Energy Northwest quality requirements.

6.0 References

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238)

2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322)

3. NRC Regulatory Guide 1.177, “Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications”, Revision 2, dated January 2021 (ADAMS Accession No. ML20164A034)

4. NRC Regulatory Guide 1.200, “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities”, Revision 2, dated March 2009 (ADAMS Accession No. ML090410014)

ENCLOSURE 9

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b"

KEY ASSUMPTIONS AND SOURCES OF UNCERTAINTY

Key Assumptions and Sources of Uncertainty

1.0 Introduction

The purpose of this enclosure is to disposition the impact of Probabilistic Risk Assessment (PRA) modeling epistemic uncertainty for the Risk Informed Completion Time (RICT) Program. Nuclear Energy Institute (NEI) Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0 (Reference 1), Section 2.3.4, Item 10 requires an evaluation to determine insights that will be used to develop risk management actions (RMAs) to address these uncertainties. The baseline internal events PRA (including internal flood), fire PRA, and seismic PRA models document assumptions and sources of uncertainty and these were reviewed during the model peer reviews. Therefore, the approach taken is to review these documents to identify the items that may be directly relevant to the RICT Program calculations, to perform sensitivity analyses where appropriate, to discuss the results, and to provide dispositions for the RICT Program.

The epistemic uncertainty analysis approach described below applies to the internal events PRA and any epistemic uncertainty impacts that are unique to the fire PRA and seismic PRA are also addressed. In addition, NEI 06-09-A requires that the uncertainty be addressed in RICT Program Real Time Risk tools by consideration of the translation from the PRA model. The Real Time Risk model, also referred to as the Configuration Risk Management (CRM) model, discussed in Enclosure 8 of this license amendment request (LAR), includes internal events, flooding events, fire events, and seismic events. The model translation uncertainties evaluation and impact assessment are limited to new uncertainties that could be introduced by application of the CRM tool during RICT Program calculations.

The process used to evaluate sources of uncertainty for the RICT application follows the guidance illustrated in Figure 4-1 of EPRI TR-1016737, “Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessments” (Reference 2). The sources of uncertainty evaluation for the baseline internal events PRA considers both plant-specific sources of uncertainty and the generic uncertainties identified in EPRI TR-1016737. The Sources of Uncertainty Notebooks for the PRA models of record were reviewed to collect a listing of all sources of uncertainty that were identified as having potential impacts on the base PRA model or risk-informed applications. If the Sources of Uncertainty Notebook already provided a justification that the model uncertainty need not be evaluated further as a potential source of uncertainty for the base model or for applications (e.g., negligible contribution, best-estimate modeling, etc.), then those model uncertainties were not considered further. This information represents the input from the “base model assessment” as shown in Figure 4-1. It should be noted that the additional lists of potential generic sources of uncertainty from Table A-4 of EPRI TR-

1016737 were also considered in the sources of uncertainty notebooks for the internal events, fire, and seismic PRAs. The potential uncertainty items noted in Table A-3 of EPRI TR-1016737 overlap some of the issues already shown in Table A-4 or evaluated in the base model evaluation of sources of uncertainty. Other items in Table A-3 are noted as being adequately assessed through the industry peer review process or are properly modeled in the PRA. Lastly, some items are not applicable to CGS (e.g., PWR-specific issues). Application-specific uncertainties, as shown in Figure 4-1, are addressed in Section 3.0.

2.0 Assessment of Internal Events, Fire, and Seismic PRA Epistemic Uncertainty Impacts

To assess the impact of sources of uncertainties on RICT calculations, a review of the base case sources of uncertainty for the Internal Events, Fire, and Seismic PRAs was performed. Each identified uncertainty was evaluated with respect to its potential to significantly impact the delta-risk evaluations that will be performed for the RICT calculations. This evaluation meets the intent of the screening portion of steps C-2 and E-2 of NUREG-1855, Revision 1 (Reference 3). A total of 42 sources of uncertainty were evaluated with respect to its potential to significantly impact the importance evaluations that will be performed for the RICT calculations. Two of the 42 key assumptions and uncertainties were identified for further RICT specific sensitivity evaluations.

The calculation of a RICT is based on Incremental Core Damage Probability (ICDP) and Incremental Large Early Release Probability (ILERP). These are delta-risk measures that evaluate the change in risk over the baseline “zero maintenance” risk for the plant. In reviewing each of the candidate sources of uncertainty for the internal events/internal flooding, fire, and seismic PRAs, the following considerations were applied to determine if a RICT impact could exist. If a candidate source of uncertainty could be shown to satisfy these considerations using a qualitative evaluation, then this was considered to be adequate.

- Criterion #1: Candidate uncertainties that are qualitatively shown to have a very small impact on total risk, and would be expected to have a negligible impact on delta-CDF and delta-LERF (particularly uncertainties that pertain to parts of the model that would not impact components that are in the RICT program, such as changes to non-support system initiating event frequencies, human error probabilities not related to RICT-eligible equipment, etc.).
- Criterion #2: Candidate uncertainties that are represented through conservative PRA modeling that would be expected to have a negligible or conservative impact on delta-risk RICT calculations.

- Criterion #3: Candidate uncertainties that were identified, but for which current industry-accepted approaches and data were used, are not considered as key sources of uncertainty. This is consistent with the ASME/ANS PRA Standard definition of a “source of modeling uncertainty” which states: “a source is related to an issue in which there is no consensus approach or model and where the choice of approach or model is known to have an effect on the PRA model”. A number of these candidates were derived from the EPRI list of generic PRA uncertainties.
- Criterion #4: Candidate uncertainties that were examined via sensitivity studies to confirm that the impact on baseline CDF and LERF are negligibly small are not considered as key sources of uncertainty for the RICT program.

There were 26 key assumptions and uncertainties identified from the internal events PRA model. After review of each uncertainty was completed, there were no key assumptions or uncertainties identified that could impact the RICT calculations in a non-conservative manner. Two RICT specific sensitivities were performed on high pressure core spray (HPCS) assumed failure with containment failure and conditional probability of loss of offsite power (LOSP) on a plant trip. The results of these sensitivity cases showed less than 5% change in the delta risk metrics indicating that these sources of uncertainty have a negligible impact on the RICT calculations.

For the fire PRA model, there were 11 key assumptions and uncertainties identified. After review of each uncertainty was completed, there were no key assumptions or uncertainties identified that could impact the RICT calculations in a non-conservative manner.

Lastly, there were 5 key assumptions and uncertainties identified from the seismic PRA model. After review of each uncertainty was completed, there were no key assumptions or uncertainties identified that could impact the RICT calculations in a non-conservative manner.

3.0 Assessment of Translation (Real Time Risk Model) Uncertainty Impacts

Incorporation of the baseline PRA models into the CRM model used for RICT Program calculations may introduce new sources of model uncertainty. Table E9-1 provides a description of the relevant model changes and dispositions of whether any of the changes made represent possible new sources of model uncertainty that must be addressed. Refer to Enclosure 8 for additional discussion on the CRM model.

Table E9-1: Assessment of Translation Uncertainty Impacts

CRM Model Change and Assumption	Part of Model Affected	Impact on Model	Disposition
PRA model logic structure may be optimized to increase solution speed.	Fault tree logic model structure, affecting internal events, fire, and seismic PRAs	The model, if restructured, will be logically equivalent and produce results comparable to the base PRA logic model.	Since the restructured model will produce comparable numerical results, this is not a source of uncertainty for the RICT program.
Set plant availability (Reactor Critical Years Factor) basic event to 1.0.	Risk metric calculated in per reactor critical years versus per calendar years.	Initiating event frequencies are calculated in per reactor critical years. The availability factor is used in the base PRA to convert the risk metric to calendar years for average risk. The CRM model evaluates specific configurations during at-power conditions with the reactor critical, so the conversion is not required, and the factor is 1.0.	This change is consistent with CRM Tool practice; therefore, this change does not represent a source of translation uncertainty and RICT program calculations are not impacted. Therefore, no mandatory RMAs are required.

4.0 References

1. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322).

2. EPRI Technical Report TR-1016737, “Treatment of Parameter and Model Uncertainty for Probabilistic Risk Assessments”, dated December 2008.

3. NRC NUREG-1855, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making”, Revision 1, dated March 2017 (ADAMS Accession No. ML17062A466).

ENCLOSURE 10

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times TSTF-505, Revision 2, "Provide Risk-Informed Extended Completion Times – RITSTF Initiative 4b"

PROGRAM IMPLEMENTATION

Program Implementation

1.0 Introduction

Section 4.0, Item 11 of the NRC Final Safety Evaluation (Reference 1) for NEI 06-09-A (Reference 2) requires that the license amendment request (LAR) provide a description of the implementing programs and procedures regarding plant staff responsibilities for the Risk Managed Technical Specifications (RMTS) implementation, and specifically discuss the decision process for risk management action (RMA) implementation during a Risk-Informed Completion Time (RICT). Several procedures and processes are detailed in other enclosures that are not repeated in this enclosure addressing Probabilistic Risk Assessment (PRA) Model Update, Cumulative Risk Assessment, Monitoring Program and RMAs.

This enclosure provides a description of the implementing programs and the administrative controls and procedures regarding the plant staff responsibilities for the RICT Program, including training of plant personnel, and specifically discusses the decision process for RMA implementation during extended Completion Times (CT).

2.0 RICT Program and Procedures

Energy Northwest will develop a program description and implementing procedures for the RICT Program. The program description will establish the management responsibilities and general requirements for risk management, training, implementation, and monitoring of the RICT program. More detailed procedures will provide specific responsibilities, limitations, and instructions for implementing the RICT program. The program description and implementing procedures will incorporate the programmatic requirements for the RMTS included in NEI 06-09-A. The program will be integrated with the online work control process. The work control process currently identifies the need to enter a Limiting Condition for Operation (LCO) action statement as part of the planning process and will additionally identify whether the provisions of the RICT program are requirements for the planned work. The risk thresholds associated with 10 CFR 50.65(a)(4) performance monitoring provisions and Mitigating System Performance Index (MSPI) thresholds will assist in controlling the amount of risk expended in use of the RICT program.

The Operations Department (licensed operators) is responsible for compliance with the Technical Specification (TS) and will be responsible for the implementation of the RICTs and RMAs. Entry into the RICT program will require management approval prior to pre-planned activities and as soon as practicable following emergent conditions.

The procedures for the RICT program will address the following attributes consistent with NEI 06-09-A:

- Plant management positions with authority to approve entry into RICT Program.
- Important definitions related to the RICT Program.
- Departmental and position responsibilities for activities in the RICT Program.
- Plant conditions for which the RICT Program is applicable.
- Limitations on implementing RICTs under voluntary and emergent conditions.
- Implementation of the RICT and risk management action time (RMAT) within 12 hours or within the most limiting front-stop CT after a plant configuration change.
- Requirement to identify and implement RMAs when the RMAT is exceeded or is anticipated to be exceeded, and to consider common cause failure potential in emergent RICTs.
- Guidance on the use of RMAs including the conditions under which they may be credited in RICT calculations.
- Conditions for exiting a RICT.
- Documentation requirements related to individual RICT evaluations, implementation of extended CTs, and accumulated annual risk.

3.0 RICT Program Training

The scope of training for the RICT Program will include rules for the new TS program, configuration risk management (CRM) software, TS Actions included in the program, and procedures. This training will be conducted for the following Energy Northwest personnel:

- Operations manager
- Operations personnel (licensed and non-licensed)
- Outage manager
- Plant manager
- Selected work management
- Regulatory affairs
- Selected maintenance
- Selected engineering
- Operations training
- Risk management/PRA
- Training management
- Other selected management

Training will be carried out in accordance with the Energy Northwest training procedures and processes. These procedures were written based on the Institute of Nuclear Power Operations (INPO) Accreditation requirements, as developed and maintained by the

Nation Academy for Nuclear Training. Energy Northwest will plan on two levels of training for the implementation of the RICT Program, as described below.

3.1 Level 1 Training

This is the most detailed training. It is intended for those individuals who will be directly involved in the implementation of the RICT Program. This level of training includes the following attributes:

- Specific training on the revised TS
- Record keeping requirements
- Case studies
- Hands-on experience with the CRM tool for calculating RMAT and RICT
- Identifying appropriate RMAs
- Common cause failure RMA considerations in emergent RICTs
- Other detailed aspects of the RICT Program

3.2 Level 2 Training

This training is applicable to plant management positions with authority to approve entry into the RICT Program, as well as supervisors, managers, and other personnel who will closely support RICT implementation. Additionally, this training will be given to remaining personnel who require an awareness of the RICT Program. These individuals need a broad understanding of the purpose, concepts, and limitations of the RICT Program. Level 2 training is different from Level 1 training in that hands-on experience with the CRM software, case studies, and other specifics are not required.

4.0 References

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238).

2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322).

ENCLOSURE 11

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times
– RITSTF Initiative 4b”

MONITORING PROGRAM

Monitoring Program

1.0 Introduction

Section 4.0, Item 12 of the NRC Final Safety Evaluation (Reference 1) for NEI 06-09-A (Reference 2) requires that the license amendment request (LAR) provide a description of the implementation and monitoring program as described in Regulatory Guide (RG) 1.174, “An Approach For Using Probabilistic Risk Assessment In Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 1 (Reference 3), and NEI 06-09-A. (Note that Revision 2 of RG 1.174 (Reference 4) was issued by the NRC in May 2011 and made editorial changes to the applicable section referenced in the NRC SE for Section 4.0, Item 12. Also note that Revision 3 of RG 1.174 (Reference 5) was issued by the NRC in January 2018 and the relevant guidance regarding the implementation and monitoring program remain substantially the same.)

This enclosure provides a description of the process applied to monitor the cumulative risk impact of implementation of the Risk-Informed Completion Time (RICT) Program, specifically the calculation of cumulative risk of extended Completion Times (CTs). Calculation of the cumulative risk for the RICT Program is discussed in Step 14 of Section 2.3.1 and Step 7.1 of Section 2.3.2 of NEI 06-09-A (Reference 2). General requirements for a Performance Monitoring Program for risk-informed applications are discussed in Element 3 of RG 1.174, Revision 3 (Reference 5).

2.0 Description of Monitoring Program

The RICT Program will require calculation of cumulative risk impact at least every refueling cycle, not to exceed 24 months, consistent with the guidance in NEI-06-09-A (Reference 2). For the assessment period under evaluation, data will be collected for the risk increase associated with each application of an extended CT for both core damage frequency (CDF) and large early release frequency (LERF). The total risk impact will be calculated by summing all risk associated with each RICT application. This summation is the change in CDF or LERF above the zero maintenance baseline levels during the period of operation in the extended CT (i.e., beyond the front-stop CT). The change in risk will be converted to average annual values and documented every fuel cycle.

The total average annual change in risk for extended CTs will be compared to the guidance of RG 1.174, Revision 3, Figures 4 and 5 (Reference 5), acceptance guidelines for CDF and LERF, respectively. If the actual annual risk increase is acceptable (i.e., not in Region I of Figures 4 and 5 of RG 1.174), then RICT Program implementation is acceptable for the assessment period. Otherwise, further assessment of the cause of exceeding the acceptance guidelines of RG 1.174 and implementation of any necessary corrective actions to ensure future plant operation is within the guidelines will be conducted under the corrective action program.

The evaluation of the cumulative risk will also identify areas for consideration, such as:

- RICT applications that dominated and incurred a large portion of the risk increase
- Risk contributions from planned versus emergent RICT applications
- Risk Management Actions (RMAs) implemented but not credited in the risk calculations
- Risk impact from applying RICT to avoid multiple shorter duration outages

Based on a review of the considerations above, corrective actions will be developed and implemented as appropriate. These actions may include:

- Administrative restrictions of the use of RICTs for specific high-risk configurations
- Additional RMAs for specific configurations
- Rescheduling planned maintenance activities
- Deferring planned maintenance to shutdown conditions
- Use of temporary equipment to replace out-of-service systems, structures, or components (SSCs)
- Plant modifications to reduce risk impact of future planned maintenance configurations

In addition to impacting cumulative risk, the implementation of the RICT Program may potentially impact the unavailability of SSCs. The Maintenance Rule (MR) monitoring programs under 10 CFR 50.65 provide for evaluation and disposition of unavailability impacts which may be incurred from implementation of the RICT Program. The SSCs in the scope of the RICT Program which are also in the scope of the MR allows the use of the MR Program.

The monitoring program of the MR, along with the specific assessment of cumulative risk impact described above, serve as the Implementation and Monitoring Program for the RICT Program as described in Element 3 of RG 1.174 (Reference 5) and NEI 06-09-A (Reference 2).

3.0 References

1. Letter from the NRC to NEI, “Final Safety Evaluation for Nuclear Energy Institute (NEI) Topical Report (TR) NEI 06-09, ‘Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines (TAC No. MD4995)”, dated May 17, 2007 (ADAMS Accession No. ML071200238)
2. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322)
3. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 1, dated November 2002 (ADAMS Accession No. ML023240437)
4. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 2, dated May 2011 (ADAMS Accession No. ML100910006)
5. NRC Regulatory Guide 1.174, “An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis”, Revision 3, dated January 2018 (ADAMS Accession No. ML17317A256)

ENCLOSURE 12

COLUMBIA GENERATING STATION

License Amendment Request

Revise Technical Specifications to Adopt Risk Informed Completion Times
TSTF-505, Revision 2, “Provide Risk-Informed Extended Completion Times
– RITSTF Initiative 4b”

RISK MANAGEMENT ACTION EXAMPLES

Risk Management Action Examples

1.0 Introduction

This enclosure describes the process for identification and implementation of Risk Management Actions (RMAs) applicable during extended Completion Times (CTs) and provides examples of how the process would be implemented. Energy Northwest procedures used for planning and scheduling maintenance activities will govern RMAs. The procedures will provide guidance for the determination and implementation of RMAs when entering the Risk-Informed Completion Time (RICT) Program consistent with the guidance provided in NEI 06-09-A (Reference 1).

2.0 Responsibilities

For planned entries into the RICT Program, Work Management is responsible for developing the RMAs with assistance from Operations and Risk Management. For emergent entry into extended CTs, Operations is responsible for developing the RMAs, but may seek assistance from Risk Management or Work Management. Operations is responsible for approval and implementation of all RMAs (for planned and emergent conditions).

3.0 Procedural Guidance

For planned maintenance activities, implementation of RMAs will be required if it is anticipated that the risk management action time (RMAT) will be exceeded. For emergent activities, RMAs must be implemented if the RMAT is reached. Also, if an emergent event occurs requiring recalculation of an RMAT already in place, the procedure will require a reevaluation of the existing RMAs for the new plant configuration to determine if additional RMAs are appropriate. These requirements of the RICT Program are consistent with the guidance of NEI 06-09-A.

For emergent entry into a RICT, if the extent of condition is not known, RMAs related to the success of redundant and diverse SSCs will be developed and implemented to address the potential for common cause failure modes. These RMAs will focus on reducing the likelihood of initiating events that rely on the affected function as well as protecting the in-service equipment that performs the redundant and diverse functions.

RMAs will be implemented no later than the time at which an incremental core damage probability (ICDP) of 1E-06 is reached, or no later than the time when an incremental large early release probability (ILERP) of 1E-07 is reached. If, as the result of an emergent condition, the instantaneous core damage frequency (ICDF) or the instantaneous large early release frequency (ILERF) exceeds 1E-03 per year or 1E-04 per year, respectively, RMAs are also required to be implemented. These requirements are consistent with the guidelines of NEI 06-09-A.

By determining which initiators, fire compartments, or components are most important from a CDF or LERF perspective for a specific plant configuration, RMAs may be created to protect these components or increase awareness as it relates to their importance. Similarly, knowledge of the initiating event or sequence contribution to the configuration-specific CDF or LERF allows development of RMAs that enhance the capability to mitigate such events. The guidance in NUREG-1855, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making”, Revision 1 (Reference 2), and EPRI TR-1026511, “Practical Guidance on the Use of PRA in Risk-Informed Applications with a Focus on the Treatment of Uncertainty” (Reference 3), will be used in examining PRA results for significant contributors for the configuration, to aid in identifying appropriate compensatory measures (e.g., related to risk-significant systems that may provide diverse protection, important support systems, important human actions).

If the planned activity or emergent condition includes an SSC that is identified to impact fire PRA, as identified in the current Real Time Risk Program, fire PRA specific RMAs associated with that SSC will be implemented per procedure. Common cause RMAs will also be considered for emergent conditions where the extent of condition cannot rule out the potential for common cause failures.

It is possible to credit RMAs in RICT calculations, to the extent the associated plant equipment and operator actions are modeled in the PRA; however, such quantification of RMAs is neither required nor expected by NEI 06-09-A. Nonetheless, if RMAs will be credited in RICT calculations, procedure instructions will be consistent with the guidance in NEI 06-09-A.

NEI 06-09-A classifies RMAs into the three categories described below:

1) Actions to increase risk awareness and control.

    - Shift briefings
    - Pre-job briefings
    - Presence of system engineer or other expertise related to the activity
    - Management approval of the proposed activity
    - Prioritizing the restoration of out-of-service components
    - Identifying and protecting important in-service components

2) Actions to reduce the duration of maintenance activities.

    - Pre-staging parts and materials

- Performing walk-downs of the system tag-outs and key equipment prior to beginning the work
- Develop critical activity procedures for risk-significant configurations, including identification of the associated risk and contingency plans for approaching/exceeding the RICT
- Conduct training on mock-ups to familiarize maintenance personnel prior to the work
- Performing the activity around the clock rather than “day-shift only”
- Establish contingency plans to restore key out-of-service equipment rapidly if needed

3) Actions to minimize the magnitude of the risk increase.

- Suspend or minimize activities on or in the vicinity of redundant systems
- Suspend or minimize activities on other systems that adversely affect the CDF or LERF
- Suspend or minimize activities on systems that may cause a trip or transient to minimize the likelihood of an initiating event that the out-of-service component is designed to mitigate
- Use temporary equipment to provide backup power, ventilation, etc.
- Reschedule other risk-significant activities
- Expedite equipment return to service to reduce risk levels
- Establish alternate success paths for performing the safety function of the out-of-service SSC

Determining RMAs involves the use of both qualitative and quantitative considerations for the specific plant configuration and the practical means available to manage risk. A graded approach is used to identify the scope of RMAs that are appropriate for managing the risk. Procedural guidance for the development of RMAs in support of the RICT program builds off other processes, such as actions taken under the 10 CFR 50.65(a)(4) program and the protected equipment program. Additionally, common cause RMAs may be developed to address the potential impact of common cause failure modes, which is performed in conjunction with an extent of condition review as governed by the Columbia Generating Station Safety Function Determination Program (per Technical Specification 5.5.11).

Energy Northwest procedures will provide general guidance for developing RMAs, such as:

- Consideration of rescheduling maintenance to reduce risk
- Discussion of RICT in pre-job briefs
- Consideration of proactive return-to-service of other equipment
- Efficient execution of the maintenance

In addition to RMAs developed qualitatively, RMAs are developed based on the Real-Time Risk tool to identify configuration-specific RMA candidates to manage the risk associated with internal events, internal flooding, fire, and seismic events. These actions include:

- Identification of important equipment or divisions for protection
- Identification of important operator actions for crew briefings or just-in-time training
- Identification of key fire initiators and fire zones for RMAs
- Identification of dominant initiating events and actions to minimize their occurrence
- Consideration of insights from dominant PRA model cutsets

Common cause RMAs may also be developed to ensure availability of redundant SSCs, to ensure availability of diverse systems, to reduce the likelihood of initiating events that the out-of-service components are designed to mitigate, and to prepare plant personnel to respond to additional failures. Common cause RMAs are developed by considering the impact of loss of function for the affected SSCs.

Examples of common cause RMAs include:

- Performance of non-intrusive inspections on alternate divisions
- More frequent monitoring for running or standby components
- Expansion of component monitoring
- Deferring maintenance and testing activities that could generate or increase the frequency of an initiating event which would require operation of potentially affected SSCs
- Readiness of operators and maintenance to respond to additional failures
- Shift briefs or standing orders that focus on initiating event response or loss of potentially affected SSCs

Energy Northwest procedures will require that for emergent conditions where the extent of condition is not performed prior to exceeding the RMAT or the extent of condition cannot rule out the potential for common cause failure, common cause RMAs are expected to be implemented. These RMAs can include the pre-identified, general RMAs as discussed above, as well as alternative common cause RMAs for the specific configuration.

4.0 Examples

Multiple example RMAs that may be considered during a RICT Program entry to reduce the risk impact and ensure adequate defense-in-depth are provided below. Specific examples are given for the inoperability of one Diesel Generator (DG), one offsite electrical power source, one offsite circuit with one inoperable DG, one battery charger, one battery, one electrical distribution subsystem, and one Residual Heat Removal (RHR) pump.

4.1 One Required DG Inoperable

For TS 3.8.1.B, one required DG inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
    - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures associated with loss of offsite power and station blackout events. This may include a review of alternate electrical alignments, considering the inoperable DG, that may be needed during a loss of offsite power or station blackout event.
    - Perform walkdowns of the remaining operable DGs to validate their standby/readiness condition.
    - Communicate the configuration to the transmission system operator so that any planned activities with the potential to cause a grid disturbance can be closely coordinated or deferred.
    - Minimize the accumulation of transient combustibles in accordance with the station fire protection program; this would include a heightened focus on the fire zones that have become more important because of the inoperable DG.
    - Do not allow hot work, particularly in the fire zones that have become more important due to the configuration (e.g., to protect electrical cables that provide alternate means of powering risk significant equipment).

2) Actions to reduce the duration of maintenance activities.
    - For preplanned RICT entry, an equipment outage schedule may be used that identifies and plans all needed resources and provides logic ties between critical activities.
    - Confirmation of parts availability prior to entry into a preplanned RICT.
    - Designate additional resources to improve efficiency (e.g., designate a resource to be a parts or tools expediter to maximize wrench time).
    - Walkdown systems prior to beginning the work and stage equipment (hoses, fittings, tools, etc.) needed to conduct the tagging and the maintenance.

3) Actions to minimize the magnitude of the risk increase.
    - Proactively implement RMAs during times of high grid stress conditions, such as during high demand conditions.
    - Evaluate weather conditions for threats to the reliability of offsite power supplies.
    - Defer elective maintenance in the switchyard and on the station’s electrical distribution systems.

- Defer planned maintenance or testing that may impact the reliability of operable DGs and associated support equipment.
- Implement 10 CFR 50.65(a)(4) fire-specific RMAs associated with the affected DG.
- Implement the protected equipment program for the inoperable DG (protect operable DGs and other important equipment).
- Maintain detection, suppression, and fire zone barriers intact and minimize transient combustibles for those fire areas identified as being significant for the configuration.
- Curtail non-essential electrical switching operations to minimize the potential for deenergizing electrical buses.

4.2 One Offsite Circuit Inoperable

For TS 3.8.1.A, one offsite circuit inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
    - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures associated with loss of offsite power and station blackout events. This may include a review of alternate switchyard alignments, considering the inoperable offsite source.
    - Limit access (e.g., vehicle traffic) and other activities in the switchyard; perform periodic walkdowns of the switchyard to validate no unauthorized activities are in progress.
    - Routine communications with the transmission system operator so that any planned activities with the potential to cause a grid disturbance can be closely coordinated or deferred.
    - Minimize the accumulation of transient combustibles in accordance with the station fire protection program; this would include a heightened focus on the fire zones that have become more important because of the plant configuration (e.g., onsite power sources).
    - Do not allow hot work, particularly in the fire zones that have become more important due to the configuration (e.g., to protect electrical cables that provide onsite power to risk significant equipment).

2) Actions to reduce the duration of maintenance activities.
    - For preplanned RICT entry, an equipment outage schedule may be used that identifies and plans all needed resources and provides logic ties between critical activities.
    - Confirmation of parts availability prior to entry into a preplanned RICT.
    - Close communication and coordination between site operations and transmission grid operators to ensure the activities rendering the offsite circuit

inoperable are progressing as expected and if not, additional resources are applied to reduce the duration of the activity.

3) Actions to minimize the magnitude of the risk increase.
    - Proactively consider additional RMAs during times of high grid stress conditions, such as during high demand conditions.
    - Evaluate weather conditions for threats to the reliability of the remaining offsite power supplies.
    - Defer elective maintenance in the switchyard and on the station's electrical distribution systems.
    - Defer planned maintenance or testing that may impact the reliability of DGs and associated support equipment.
    - Implement 10 CFR 50.65(a)(4) fire-specific RMAs associated with the offsite source.
    - Implement the protected equipment program for the inoperable offsite source. This may include limiting access to the switchyard (e.g., locked gates), barricading and/or posting transformer areas, and/or posting rooms containing 4160V electrical buses).
    - Maintain detection, suppression, and fire zone barriers intact and minimize transient combustibles for those fire areas identified as being significant for the configuration.
    - Curtail non-essential electrical switching operations to prevent losing the remaining offsite source and to prevent challenging the availability of onsite electrical power.

4.3 One Offsite Circuit Inoperable and One Required DG Inoperable

For TS 3.8.1.D, one offsite circuit inoperable and one required DG inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
    - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures associated with loss of offsite power and station blackout events. This may include a review of alternate switchyard alignments, considering the inoperable offsite source.
    - Limit access (e.g., vehicle traffic) and other activities in the switchyard; perform periodic walkdowns of the switchyard to validate no unauthorized activities are in progress.
    - Routine communications with the transmission system operator so that any planned activities with the potential to cause a grid disturbance can be closely coordinated or deferred.
    - Minimize the accumulation of transient combustibles in accordance with the station fire protection program; this would include a heightened focus on the

fire zones that have become more important because of the plant configuration.

- Perform walkdowns of the remaining operable DGs to validate their standby/readiness condition.
- Do not allow hot work, particularly in the fire zones that have become more important due to the configuration (e.g., to protect electrical cables that provide onsite power to risk significant equipment).

2) Actions to reduce the duration of maintenance activities.
   - Close communication and coordination between site operations and transmission grid operators to ensure the activities rendering the offsite circuit inoperable are progressing as expected and if not, additional resources are applied to reduce the duration of the activity.
   - Engage senior managers and executives to ensure the transmission operators are utilizing all resources with an extreme sense of urgency as it relates to restoring the offsite circuit to an operable status (considering also having one inoperable DG).

3) Actions to minimize the magnitude of the risk increase.
   - Proactively consider additional RMAs during times of high grid stress conditions, such as during high demand conditions.
   - Evaluate weather conditions for threats to the reliability of the remaining offsite power supplies.
   - Allow no mission critical maintenance (no activities that aren’t related to restoring the DG or the offsite source) in the switchyard or on the station’s electrical distribution systems.
   - Defer all planned maintenance or testing that may impact the reliability of DGs and associated support equipment.
   - Implement 10 CFR 50.65(a)(4) fire-specific RMAs associated with the offsite source and the inoperable DG.
   - Implement the protected equipment program for the inoperable offsite source and the inoperable DG. This may include limiting access to the switchyard (e.g., locked gates), barricading and/or posting transformer areas, and posting rooms containing 4160V electrical buses, etc.).
   - Maintain detection, suppression, and fire zone barriers intact and minimize transient combustibles for those fire areas identified as being significant for the configuration.
   - Curtail non-essential electrical switching operations to prevent losing the remaining offsite source and to prevent challenging the availability of onsite electrical power.

4.4 One Required Battery Charger Inoperable

For TS 3.8.4.A, one required Division 1 or 2 125V DC battery charger inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
   - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures associated with loss of offsite power and station blackout events.
   - Brief the on-shift operations crew concerning the impact the DC division has on the potential response to plant events such as reduced control systems.
   - Prior to removal from service for a planned RICT, the actions in the associated loss of bus procedure may be reviewed by crews at the beginning of the shift.
   - Minimize the accumulation of transient combustible in accordance with the station fire protection program for the impacted fire zones.
   - Minimize activities that could trip the unit (e.g., do not perform maintenance or testing on Reactor Protection System Instrumentation).

2) Actions to reduce the duration of maintenance activities:
   - For preplanned RICT entry, an equipment outage schedule may be used that identifies and plans all needed resources and provides logic ties between critical activities.
   - Confirmation of parts availability prior to entry into a preplanned RICT.
   - Walkdown of work prior to execution.

3) Actions to minimize the magnitude of the risk increase.
   - Proactively implement RMAs during times of high grid stress conditions, such as during high demand conditions.
   - Evaluation of weather conditions for threats to the reliability of offsite power supplies.
   - Deferral of elective maintenance on the station’s redundant electrical distribution systems.
   - Deferral of planned maintenance or testing that affects the reliability of the DGs and their associated support equipment.
   - Protect DC electrical buses, DC batteries, and other support equipment.
   - Consider briefing operating crews on the removal of nonessential loads from the DC battery to extend the time voltage will remain above minimum required levels.
   - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs for the associated bus and battery charger.

- Maintain detection, suppression, and fire zone barriers intact and minimize transient combustibles for those fire zones identified as being risk significant for the configuration.

4.5 One Required Battery Inoperable

For TS 3.8.4.D, one required Division 1 or 2 125V DC battery inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
    - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures associated with loss of DC power and station blackout events.
    - Brief the on-shift operations crew concerning the impact the DC division has on the potential response to plant events such as reduced control systems.
    - Prior to removal from service for a planned RICT, the actions in the associated loss of DC bus procedure may be reviewed by crews at the beginning of the shift.
    - Minimize the accumulation of transient combustible in accordance with the station fire protection program for the impacted fire zones.
    - Minimize activities that could trip the unit (e.g., do not perform maintenance or testing on Reactor Protection System Instrumentation).

2) Actions to reduce the duration of maintenance activities:
    - For preplanned RICT entry, an equipment outage schedule may be used that identifies and plans all needed resources and provides logic ties between critical activities.
    - Confirmation of parts availability prior to entry into a preplanned RICT.
    - Walkdown of work prior to execution.

3) Actions to minimize the magnitude of the risk increase.
    - Proactively implement RMAs during times of high grid stress conditions, such as during high demand conditions.
    - Evaluation of weather conditions for threats to the reliability of offsite power supplies.
    - Deferral of elective maintenance in the switchyard and on the station’s electrical distribution systems.
    - Deferral of planned maintenance or testing that affects the reliability of the DGs and their associated support equipment.
    - Protect DC electrical buses, DC batteries, and other support equipment.
    - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs for the associated bus and battery.

- Maintain detection, suppression, and fire zone barriers intact and minimize transient combustibles for those fire zones identified as being risk significant for the configuration.

4.6 One Division 1 or 2 AC Electrical Power Distribution Subsystem Inoperable

For TS 3.8.7.A, one Division 1 or 2 AC electrical power distribution subsystem inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
    - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures and the electrical load list associated with the inoperable AC distribution subsystem.
    - Brief the on-shift operations crew concerning the impact the AC division has on the potential response to plant events.
    - Prior to removal from service for a planned RICT, the actions in the associated loss of AC bus procedure may be reviewed by crews at the beginning of the shift.
    - Minimize the accumulation of transient combustible in accordance with the station fire protection program for the impacted fire zones.

2) Actions to reduce the duration of maintenance activities:
    - For preplanned RICT entry, an equipment outage schedule may be used that identifies and plans all needed resources and provides logic ties between critical activities.
    - Confirmation of parts availability prior to entry into a preplanned RICT.
    - Walkdown of work prior to execution.

3) Actions to minimize the magnitude of the risk increase.
    - Deferral of elective maintenance in the switchyard and on the station’s electrical distribution systems.
    - Deferral of planned maintenance or testing that affects the reliability of the DGs and their associated support equipment.
    - Protect redundant AC electrical buses and other support equipment.
    - Implementation of 10 CFR 50.65(a)(4) fire-specific RMAs for the associated AC bus.
    - Maintain detection, suppression, and fire zone barriers intact and minimize transient combustibles for those fire zones identified as being risk significant for the configuration.

4.7 One Required RHR Pump Inoperable

For TS 3.5.1.A, one low pressure ECCS injection/spray subsystem inoperable, RMAs may include:

1) Actions to increase risk awareness and control.
   - Brief the on-shift operations crew concerning the unit activities, including any compensatory measures established. Specific focus areas would be to review emergency or abnormal operating procedures associated with loss of coolant accident events.
   - Perform a walkdown and validation of the remaining ECCS systems to validate standby/readiness.
   - Minimize the accumulation of transient combustible in accordance with the station fire protection program for the impacted fire zones.
   - Assess the existing reactor coolant system (RCS) operational leakage rate prior to entering the RICT; consider deferral of the RICT if RCS leakage is elevated and/or the source of leakage is unknown.

2) Actions to reduce the duration of maintenance activities.
   - For preplanned RICT entry, an equipment outage schedule may be used that identifies and plans all needed resources and provides logic ties between critical activities.
   - Confirmation of parts availability prior to entry into a preplanned RICT.
   - Walkdown of work prior to execution.

3) Actions to minimize the magnitude of the risk increase.
   - Defer planned maintenance or testing activities on the redundant ECCS low pressure injection loops and associated support equipment and treat those systems as protected equipment.
   - Defer planned maintenance or testing that affects the reliability of those safety systems that provide defense-in-depth. If testing or maintenance activities must be performed, a review of the potential risk impact will be performed.
   - Minimize activities that could trip the unit or increase the frequency of an initiating event.
   - Verify system alignment of remaining loops of low pressure ECCS.
   - Implementation of equipment protection for redundant components and diverse systems.

5.0 References

1. NEI Topical Report NEI 06-09-A, “Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines”, Revision 0, dated October 2012 (ADAMS Accession No. ML12286A322)

2. NRC NUREG-1855, “Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making”, Revision 1, dated March 2017 (ADAMS Accession No. ML17062A466)

3. EPRI Technical Report TR-1026511, “Practical Guidance on the Use of PRA in Risk-Informed Applications with a Focus on the Treatment of Uncertainty”, dated December 2012