June 23, 2014

TSTF-14-03
PROJ0753

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

SUBJECT: Response to NRC Request for Additional Information Regarding TSTF-537, Revision 0, "Increase CIV Completion Time; Update of TSTF-373"

REFERENCE: Letter from Michelle Honcharik (NRC) to Technical Specifications Task Force dated March 4, 2013, "Request for Additional Information Re: Traveler TSTF-537, Revision 0, 'Increase CIV [Containment Isolation Valve] Completion Time; Update of TSTF-373'"

On March 27, 2012, the TSTF submitted Traveler TSTF-537, Revision 0, "Increase CIV Completion Time; Update of TSTF-373," to the Nuclear Regulatory Commission for review (ADAMS Accession No. ML12087A274).

In the referenced letter, the NRC requested additional information to enable the NRC staff to complete the requested review. The enclosure to this letter responds to that request.

Should you have any questions, please do not hesitate to contact us.

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Enclosure

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The NRC Request for Additional Information is repeated below in italics, followed by the TSTF response.

Question 1

The U.S. Nuclear Regulatory Commission's (NRC's) safety evaluation (SE) of the Combustion Engineering Owners' Group (CEOG) Joint Application Report (JAR) Combustion Engineering (CE) NPSD-1168-1, "Joint Applications Report for Containment Isolation Valve AOT [Allowed Outage Time] Extension," January 2001, available in the Agencywide Documents Access and Management System (ADAMS) as Accession No. ML003721663 states:

> *We agree with the CEOG findings that, based on the use of bounding risk parameters for CE designed plants, the proposed increase in containment isolation valve (CIV) AOT from 4 hours to 7 days does not result in an unacceptable incremental conditional core damage probability (ICCDP) or incremental conditional large early release probability (ICLERP) according to the criteria of Regulatory Guide 1.177 when the items identified below are acceptably addressed by individual licensees referencing this report in plant-specific submittals.*

Given that the topical report was completed a while ago, assess whether the bounding risk parameters may still be considered bounding or not, and provide the basis for your conclusion. In addition, since generic unreliability and unavailability data can change over a long period of time, discuss whether CIV performance based on data since the completion of the JAR is consistent with assumptions made in the supporting JAR analyses, and provide the basis for the conclusions.

TSTF Response

The parameters used to support the conclusions of the JAR are summarized in Table 1.

Table 1
CE-NPSD-1168-A Parameters

Description	Value	Units
Total core damage frequency	2.00E-04	per year
Large Early Release Frequency	5.70E-06	per year
Conditional core damage probability due to SLOCA	3.75E-03	
Conditional core damage probability due to Reactor Trip	6.08E-06	
Conditional core damage probability due to SGTR	9.16E-04	
Conditional core damage probability due to seismic events	1.75E-05	
Air-operated valve (AOV) fails to remain closed	1.36E-05	per hour
AOV fails to close on demand	1.55E-03	

Table 1
CE-NPSD-1168-A Parameters

Description	Value	Units
Non-seismically induced pipe failure rate[1]	1.17E-09	Per section-hour
Number of pipe sections[1]	100	
Total non-seismically induced pipe failure frequency (plant)[1]	5.00E-03	per year
Solenoid-operated valve (SOV) fails to remain closed	1.68E-06	Per hour
SOV fails to close on demand	2.05E-03	
Non-seismically induced pipe failure probability[1]	1.00E-04	
Check valve (CV) fails to close on demand	1.52E-03	
Inadvertent opening of a relief valve	2.43E-06	Per hour
Manual valve transfers open	1.92E-07	Per hour
Manual valve fails to operate on demand	3.88E-04	
Frequency of seismically induced SLOCA	1.90E-05	Per year
Beta Factor[1]	1.00E-01	
Operator fails to isolate (HEP) ruptured steam generator[1]	1.00E-02	
CV leakage rate	8.76E-04	per hour

Note 1: The value for this parameter would remain unchanged in performing an updated JAR assessment.

Plant-specific data was requested from the Pressurized Water Reactor Owners Group (PWROG) members operating Combustion Engineering (CE)-designed plants to assess whether the parameters currently being used in their probabilistic risk assessment (PRA) models are bounded by the parameters used in the JAR evaluation. Responses to the request were received from all CE-designed plants. The responses confirmed that the plant-specific parameters used in the JAR remain bounding.

It is recognized that since the JAR was approved, generic unreliability and unavailability data could have changed to reflect more up-to-date industry operating experience. A review of current generic data provided in NUREG/CR-6928, "Industry-Average Performance for Components and Initiating Events at U.S. Commercial Nuclear Power Plants," and its updates indicates that the unreliability and unavailability for the various types of valves (i.e., air-operated, solenoid-operated, check, manual, and relief) are less than the corresponding values used in the JAR. For example, the JAR used a value of 1.36E-05 per hour and a value of 1.55E-03 per demand for the failure rate and demand failure probability, respectively, for an air-operated valve. Current generic data obtained from NUREG/CR-6928 indicates that the corresponding values for these failure modes are 1.31E-07 per hour and 9.51E-04 per demand,

respectively. The current generic data shows similar improvements in unreliability and unavailability for the other types of valves considered in the JAR evaluation. Current generic data obtained from the "CCF Parameter Estimations, 2010 Update" indicates a beta factor of 5.37E-02 for air-operated vales failing to close.

Current generic pipe failure rates were also compared with the failure rates used in the JAR. The JAR considers the component cooling water (CCW) system to be a closed-loop system inside and outside the containment. Based on results of operating experience obtained from EPRI 3002000079, "Pipe Rupture Frequencies for Internal Flooding Probabilistic Risk Assessments," Rev. 3, the current pipe failure rate for the CCW system is bounded by a frequency of 1.79E-07 per-year-ft. To estimate the overall frequency, the length of the CCW pipe inside the containment is assumed to be no more than 1000 ft. This length of piping is considered to be very conservative. Based on this estimated length of CCW pipe, the overall pipe failure frequency is bounded by 1.79E-04 per year. This demonstrates improvement over the bounding pipe failure rate used in the JAR.

Seismic Loss of Coolant Accident (LOCA) frequencies for the CE-designed plants were assessed using guidance and data in the Risk Assessment of Operational Events Handbook, Volume 2, also known as the "RASP Handbook" for external events. Based on that assessment, the range of seismically-induced LOCA frequencies is between 1.77E-06 to 1.64E-05 per year. The seismically-induced LOCA frequency of 1.90E-05 per year provided in the JAR remains bounding.

In conclusion, the parameters used in the JAR evaluation remain bounding when compared with plant-specific parameters that are currently being used in the plant PRA models. The plant-specific conditional core damage probability (CCDP) due to reactor trip at one member utility was approximately 10% greater than the value used in the JAR. An assessment of the increased CCDP determined that the change in this parameter has a negligible impact on the risk calculation and will not affect the conclusions of the JAR. It is also concluded that improvements in generic unreliability and unavailability data have been observed and the parameters used in the JAR are still bounding.

Question 2

TSTF-537 notes that the JAR identified three sets of valves to which the revised completion time (CT) will not apply. This includes containment sump supply valves to the emergency core cooling systems and containment spray system pumps, valves associated with the main feedwater system, and main steam isolation valves. Please clarify how the proposed Standard Technical Specification (STS) 3.6.3 precludes the application of the extended CT to the main feedwater valves and main steam isolation valves.

TSTF Response

LCO 3.7.2, "Main Steam Isolation Valves (MSIVs)," and LCO 3.7.3, "Main Feedwater Isolation Valves (MFIVs) [and [MFIV] Bypass Valves]," preclude application of the proposed 7 day

Completion Time when an MSIV or MFIV are inoperable. Therefore, restrictions in LCO 3.6.3 are not needed.

CE-NPSD-1168-A, Section 6.3.2.4, provides the following discussion:

> Portions of the main steam and blowdown systems inside the containment are considered to be closed for all events except a main steam line break or a steam generator tube rupture. A forced plant shutdown usually occurs when a CIV associated with penetrations in the main steam and feedwater systems becomes inoperable. The proposed CIV AOT extension considered in this report is not applicable to CIVs in the main steam and feedwater systems.

LCO 3.7.2, Condition A, applies when one MSIV is inoperable, and an inoperable MSIV must be restored to Operable status within 8 hours or a plant shutdown is required. This is shorter than the existing LCO 3.6.3 72 hour Completion Time for an inoperable CIV connected to a closed system or the proposed 7 day Completion time. Therefore, a change to the LCO 3.6.3 Completion Time will not affect the MSIV Completion Time.

LCO 3.7.3, Condition A, applies when one or more MFIVs are inoperable and Condition A.1 requires closing or isolating the inoperable MFIV within 8 or 72 hours. This is shorter than or equal to the existing LCO 3.6.3 72 hour Completion Time for an inoperable CIV connected to a closed system or the proposed 7 day Completion time. Therefore, a change to the LCO 3.6.3 Completion Time will have no effect on the MFIV Completion Time.

In summary, LCO 3.7.2 (MSIVs) and LCO 3.7.3 (MFIVs) prevent application of the proposed 7 day Completion Time to an inoperable MSIV or MFIV.

Question 3

TSTF-537 proposes to address common cause failures with Required Action B.1. Required Action B.1 should require verification that the redundant CIVs in a penetration flow path are not rendered inoperable due to reasons besides common cause failure prior to exceeding the existing 4-hour CT. Since redundant CIVs may fail due to common cause or other reasons, how does TSTF-537 ensure operability of the redundant CIVs for reasons other than common cause failure prior to entering the extended CT?

TSTF Response

The Required Action to verify that the redundant CIV in a flowpath is not inoperable due to a common cause failure is added because the supporting Topical Report (CE-NPSD-1168-A) did not address common-cause failures. As stated in Section 3.2.1 of the Topical Report:

> Common-cause failures were not addressed in the JAR. Therefore, common cause failures need to be addressed on a plant-specific basis. In this regard, the operability of the remaining CIV in a penetration flow path needs to be verified before entering the relaxed AOT interval. This action would serve to ensure that defense-in-depth is maintained. Plant-specific submittals should describe how this will be done either based

> upon technical specifications requirements, the provisions of the CRMP, or on some other acceptable basis.

TSTF-498, Rev. 1, "Risk-Informed Containment Isolation Valve Completion Times (BAW-2461)," approved on January 12, 2009 (applicable to Babcock & Wilcox plants), is similar to TSTF-537, in that the supporting analysis did not evaluate a common cause failure. In the same manner approved in TSTF-498, TSTF-537 includes a Required Action to verify the redundant CIV in the flowpath is not inoperable due to a common cause failure.

Licensees are required under LCO 3.0.2 to enter "the Required Actions of the associated Conditions" (note the plural) when an LCO is not met. Technical Specifications are based on the premise that licensees identify inoperable equipment and enter the appropriate Conditions as required by LCO 3.0.2. The verification of no common cause failure mechanism is the only instance in which the Required Action for an inoperable component requires verification of the Operability of redundant components, as a common cause failure mechanism may not be readily apparent (See LCO 3.8.1, Required Action B.3.1).

Therefore, the proposed Required Action to verify no common cause failure in combination with LCO 3.0.2 ensures the operability of the redundant CIVs prior to entering the extended CT.

Question 4

Condition E of TSTF-537 includes a change in the CT from 72 hours to 7 days. This had been proposed in TSTF-373, Revision 2, previously under Condition D.

The bases for "Required Actions" E.1 and E.2 provide criteria for penetrations:

> *Penetration flow paths eligible for application of the 7 day Completion Time meet the following criteria:*
>
> - *Containment isolation valves in penetrations connected to nonessential containment cooling systems;*
> - *The closed system piping inside containment is seismically qualified; and,*
> - *Containment isolation valves in the penetration flow paths are air operated valves designed to fail in the closed position and are designed to close automatically by an engineered safety feature actuation system (ESFAS) signal.*

a. Please indicate in which supporting documentation these criteria are discussed.

b. What is meant by a nonessential containment cooling system?

TSTF Response

a. As stated in the TSTF-537 justification, page 4, paragraph a., "The criteria for applying the 7 day CT to a penetration flow path are given in Section 6.3.2.4 of CE-NPSD-1168-A and summarized in the proposed Bases."

Section 6.3.2.4 states:

> A Class C containment penetration is connected to a seismically qualified closed loop piping inside the containment. The closed loop system and the CIVs for the penetration represent the barriers between the containment atmosphere and the outside environment. Closed loop systems inside the containment that function as a containment barrier included component cooling water, main steam, feedwater, and steam generator blowdown. Portions of the main steam and blowdown systems inside the containment are considered to be closed for all events except a main steam line break or a steam generator tube rupture. A forced plant shutdown usually occurs when a CIV associated with penetrations in the main steam and feedwater systems becomes inoperable. The proposed CIV AOT extension considered in this report is not applicable to CIVs in the main steam and feedwater systems. Based on the functions of the remaining penetrations, the following two generic configurations for Class C penetrations were identified for the CE PWRs.
>
> - Penetrations Connected to the Non-Essential Containment Cooling Units
> - Penetrations Connected to the Secondary Side of the Steam Generators
>
> The above configurations for Class C containment penetrations are described below in subsections 6.3.2.4.1 and 6.3.2.4.2.

b. The nonessential containment cooling system is described in Section 6.3.2.4.1 of CE-NPSD-118-A, which states, in part:

> This generic configuration for Class C penetrations represents the containment piping penetrations that provide inflow and outflow of cooling water to the non-essential containment cooling units. These cooling units are used for containment heat removal during normal power operation. ... A typical schematic for this configuration is shown in Figure 8. ... Containment heat removal by the non-essential cooling units is not required or needed to accomplish or support any of the safety functions for preventing core damage. At least one of the CIVs for this configuration is designed to close automatically by SIAS or CIAS following a design basis event.

Question 5

Section 2.3, "Verification and Commitments," of the model application does not mention the following important considerations in the licensee's submittal for this Traveler:

a. Regulatory Guide (RG) 1.174 for probabilistic risk assessment quality considerations, and other information for risk-informed considerations.

TSTF Response

The supporting Topical Report, CE-NPSD-1168-A, contains the risk assessment of the proposed change. The NRC Safety Evaluation for the Topical Report, Section 3.2.1, states,

> The risk measures used to assess the impact of the proposed changes are consistent with the measures defined in Regulatory Guide 1.174, 'An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis,' and Regulatory Guide 1.177, 'An Approach for Plant-Specific, Risk-Informed Decision Making: Technical Specifications,' with only minor changes. Regulatory Guide 1.177 provides for a three-tiered approach to evaluate the risks associated with the proposed license amendments.

As CE-NPSD-1168-A contained a bounding evaluation applicable to all CE plants and that evaluation was determined by the NRC to be consistent with RG 1.174, no plant-specific discussion of RG 1.174 quality considerations is needed in TSTF-537.

b. Licensees adopting this Traveler must confirm plant-specific implementation and monitoring in accordance with the guidance in RG 1.174 and RG 1.177;

TSTF Response

The model application contains a verification which must be made by the licensee which states: "[LICENSEE] confirms that the generic bounding analysis presented in CE-NPSD-1168-A is applicable to [PLANT] and that the plant-specific risk, including the effects of external events, meets the risk guidelines of Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk- Informed Decision Making: Technical Specifications."

Regarding monitoring, see the response to Question 5.j.

c. Plant-specific Tier 3 information must be provided in submittals;

TSTF Response

Tier 3 is a configuration risk management program (CRMP). As described in the justification:

> The NRC Safety Evaluation associated with CE-NPSD-1168-A was issued prior to the changes associated with 10 CFR 50.65(a)(4) becoming effective. (The NRC Safety Evaluation for CE-NPSD-1168 is dated 6/26/2000 and 10 CFR 50.65(a)(4) became effective on 11/28/2000.) With the implementation

of 10 CFR 50.65(a)(4), licensees are required to assess and manage the risk that may result from proposed maintenance activities. The staff concluded in the Safety Evaluation for TSTF-373 that the activities necessary for implementation of 10 CFR 50.65(a)(4) satisfy the condition in the NRC Safety Evaluation for implementing a CRMP and supersede the need for a separate program.

As all licensees are required to comply with 10 CFR 50.65(a)(4), no plant-specific Tier 3 information is needed when adopting TSTF-537.

In addition, the model application contains two verifications which must be made by the licensee, which state:

- [LICENSEE] confirms that the quality of the PRA for [PLANT] is sufficient with respect to its use for Tier 3 for this application as described in Regulatory Guide 1.177; and

- [LICENSEE] commits to the guidance of NUMARC 93–01, Revision 4, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Section 11, which provides guidance and details on the assessment and management of risk during maintenance as an ongoing commitment.

d. The Tier 3 Configuration Risk Management Program (CRMP) enhancement to include large early release frequency (LERF) and ICLERP is not mentioned; rather, line item Number 4 requests licensees to commit to "implementing methodologies." A licensee's CRMP, including those implemented under the maintenance rule 10 CFR 50.65(a)(4), must be enhanced to include a LERF/ICLERP assessment. This assessment must be documented in a regulatory commitment in the plant-specific application.

<u>TSTF Response</u>

The model application contains a verification which must be made by the licensee which states, " [LICENSEE] commits to implementing methodologies for assessing large early release frequency (LERF) and incremental conditional large early release probability (ICLERP) when evaluating the risk of CIV inoperability in accordance with 10 CFR 50.65(a)(4)." The licensee must also commit to controlling the commitments in accordance with NEI 99–04, Revision 0, "Guidelines for Managing NRC Commitment Changes."

e. Plant-specific applicability of Tier 2 analysis;

<u>TSTF Response</u>

The model application contains a verification which must be made by the licensee which states: "[LICENSEE] confirms that the generic bounding analysis presented in CE-NPSD-1168-A is applicable to [PLANT] and that the plant-specific risk, including the effects of external events, meets the risk guidelines of Regulatory Guide 1.177, 'An

Approach for Plant-Specific, Risk- Informed Decision Making: Technical Specifications'."

The generic bounding analysis in CE-NPSD-1168-A includes the Tier 2 analysis.

f. The licensee considers specific penetrations consistent with those analyzed, and provides a plant-specific analysis for configurations not addressed by the groups described in CE-NPSD-1168-A;

TSTF Response

The model application contains a verification which must be made by the licensee which states: "[LICENSEE] confirms that the CIV penetration configurations eligible for use of the extended CT fall within the 14 containment penetration configurations considered in CE-NPSD-1168-A." The TSTF-537 justification states, "The proposed change is not applicable to CIV penetration configurations that are not considered in the JAR. Plants desiring to extend the CTs in Specification 3.6.3 using a plant-specific justification are not eligible to utilize this proposed change."

g. Licensees provide supporting information that verifies that a penetration remains intact during maintenance activities, including corrective maintenance;

TSTF Response

Proposed Condition B and E, which contain the 7 day Completion Time proposed in TSTF-537, both require the containment isolation valve pressure boundary to be intact. If the pressure boundary is not intact, these Conditions (and the extended Completion Time) do not apply.

TSTF-446, Rev. 3, "Risk Informed Evaluation of Extensions to Containment Isolation Valve Completion Times (WCAP-15791), approved by the NRC on 7/13/2010 (applicable to Westinghouse plants), is similar to TSTF-537, in that the supporting analysis assumes that the affected penetration remains intact during maintenance activities. In the same manner approved in TSTF-446, TSTF-537 modifies the Conditions to require that the penetration be intact for those Required Actions that utilize the extended Completion Time.

h. Licensees must confirm that the action of locking open a subject CIV will not result in the design basis technical specification leakage being exceeded;

TSTF Response

This requirement is already contained in the TS. TS 3.6.3, Action Note 4, states, "Enter applicable Conditions and Required Actions of LCO 3.6.1, 'Containment,' when leakage results in exceeding the overall containment leakage rate acceptance criteria." Should a CIV be locked open and the resulting leakage exceed the TS limit, LCO 3.6.1 would be

declared not met per Note 4. TS 3.6.1 provides 1 hour to restore the containment leakage to within limits or a plant shutdown is required.

i. For external events, in performing the plant-specific analyses, credit for physical barrier integrity outside containment can only be given for seismically qualified piping; and,

TSTF Response

No plant-specific analysis is permitted under TSTF-537. The TSTF-537 justification states, "The proposed change is not applicable to CIV penetration configurations that are not considered in the JAR. Plants desiring to extend the CTs in Specification 3.6.3 using a plant-specific justification are not eligible to utilize this proposed change."

j. Evaluation of cumulative risk on a plant-specific basis consistent with RG 1.174.

TSTF Response

Section 6.7 of CE-NPSD-1168-A addresses this issue, and states:

> In conformance with Regulatory Guide 1.177, the CEOG member utilities commit to the use of a risk-informed configuration risk management program. This program will assess the risk associated with plant maintenance activities and may be included within the plant program(s) to meet paragraph A.4 of the proposed revision to the Maintenance Rule. Risk informed cumulative unavailability targets for CIVs are already being established within the scope of the current Maintenance Rule.

Tracking of cumulative risk associated with inoperable CIVs is incorporated in the risk informed cumulative unavailability targets required under the Maintenance Rule. Separate tracking under TSTF-537 is not necessary.