FINAL SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER TSTF-584, REVISION 0 "ELIMINATE AUTOMATIC RWCU SYSTEM ISOLATION ON SLC SYSTEM INITIATION" USING THE CONSOLIDATED LINE ITEM IMPROVEMENT PROCESS (EPID L-2022-PMP-0002)

1.0 INTRODUCTION

By letter dated February 23, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22054A292), the Technical Specifications Task Force (TSTF) submitted Traveler TSTF-584, Revision 0, "Eliminate Automatic RWCU [reactor water cleanup] System Isolation on SLC [standby liquid control] System Initiation," to the U.S. Nuclear Regulatory Commission (NRC). Traveler TSTF-584, Revision 0, proposed changes to the Standard Technical Specifications (STS) for boiling-water reactor (BWR) designs. [1] These changes would be incorporated into future revisions of NUREG-1433 (BWR/4) and NUREG-1434 (BWR/6).

The proposed changes would revise the "Primary Containment Isolation Instrumentation," specification by removing the requirement of automatic isolation of the RWCU system on initiation of the SLC system. This STS change will be made available to licensees through the consolidated line item improvement process (CLIIP).

2.0 REGULATORY EVALUATION

2.1 System Descriptions

2.1.1 RWCU

Section 2.1.1 of the traveler briefly describes the RWCU system. The TSTF traveler listed the following automatic signals to the RWCU system supply and/or return isolation valves in a typical BWR design that indicate that the RWCU piping or components have been breached:

- Low reactor vessel water level;
- RWCU system high differential flow;
- Main steam tunnel penetration area temperature high; and
- RWCU heat exchanger/pump/filter demineralizer unit area high temperature.

The STS requires the above functions to be operable. The automatic closure of the supply and/or return isolation valves, coupled with the dual check valves in each RWCU system return line, isolates the RWCU system from the reactor coolant pressure boundary.

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[1] U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric Plants, BWR/4," NUREG-1433, Volume 1, "Specifications," and Volume 2, "Bases," Revision 5.0, September 2021 (ML21272A357 and ML21272A358, respectively).

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric Plants, BWR/6," NUREG-1434, Volume 1, "Specifications," and Volume 2, "Bases," Revision 5.0, September 2021 (ML21271A582 and ML21271A596, respectively).

The automatic signal for RWCU system isolation on SLC system initiation that is proposed to be removed is not used to indicate any breach of RWCU piping or components.

2.1.2 Standby Liquid Control System

During an Anticipated Transient Without Scram (ATWS) event, the SLC system would bring the reactor from full power to a subcritical condition without crediting the control rods. The SLC system injects a quantity of borated water into the reactor core that adds negative reactivity sufficient to compensate for all of the various positive reactivity effects that could occur during shutdown. In addition to its use for ATWS mitigation, some plants credit manual actuation of the SLC system following a loss of coolant accident (LOCA) to control primary containment acidity.

2.2 Proposed Changes to the Standard Technical Specifications

The proposed changes remove the requirement for automatic isolation of the RWCU system on SLC system initiation. The following are the proposed changes in NUREG-1433 and NUREG-1434:

NUREG-1433

Technical Change:

- Table 3.3.6.1-1, Function 5.d, "Reactor Water Cleanup (RWCU) System Isolation – SLC System Initiation," is deleted.

Editorial changes needed for consistency:

- Table 3.3.6.1-1, Function 5.e, "Reactor Vessel Water Level – Low Low, Level 2," is renumbered as Function 5.d.
- Table 3.3.6.1-1, Function 5.f, "Manual Initiation," is renumbered as Function 5.e.
- Table 3.3.6.1-1, Footnote (b), if present, is only referenced from Function 5.d, and is deleted.
- Table 3.3.6.1-1, Function 6.b, reference to Action J is revised to reference Action I.
- TS 3.3.6.1, Action I, which is only referenced in Function 5.d, is deleted.
- TS 3.3.6.1, Action J, is renumbered as Action I.

NUREG-1434

Technical Change:

- Table 3.3.6.1-1, Function 4.l, "Reactor Water Cleanup (RWCU) System Isolation – Standby Liquid Control System Initiation," is deleted.

Editorial changes needed for consistency:

- Table 3.3.6.1-1, Function 4.m, "Manual Initiation," is renumbered as Function 4.l.
- Table 3.3.6.1-1, Function 5.c, reference to Action J is revised to reference Action I.
- TS 3.3.6.1, Action I, which is only referenced in Function 4.l, is deleted.
- TS 3.3.6.1, Action J, is renumbered Action I.
- TS 3.3.6.1, Action K, is renumbered Action J.

2.3 Applicable Regulatory Requirements and Guidance

As described in the Commission's "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors" (58 FR 39132, dated July 22, 1993), the NRC and industry task groups for new STSs recommended that improvements include greater emphasis on human factors principles in order to add clarity and understanding to the text of the STSs and provide improvements to the Bases of the STSs, which provides the purpose for each requirement in the STSs. The improved vendor-specific STSs were developed and issued by the NRC in September 1992.

Section IV, "The Commission Policy," of the Final Policy Statement on Technical Specifications (TSs) states, in part:

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
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> …[T]he Commission will also entertain requests to adopt portions of the improved STS [(e.g., TSTF-584)], even if the licensee does not adopt all STS improvements. …The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.
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> …In accordance with this Policy Statement, improved STS have been developed and will be maintained for each NSSS [nuclear steam supply system] owners group. The Commission encourages licensees to use the improved STS as the basis for plant-specific Technical Specifications. …[I]t is the Commission intent that the wording and Bases of the improved STS be used … to the extent practicable.

The Summary section of the Final Policy Statement on TS states, in part:

> Implementation of the Policy Statement through implementation of the improved STS is expected to produce an improvement in the safety of nuclear power plants through the use of more operator-oriented Technical Specifications, Improved Technical Specification Bases, reduced action statement induced plant transients, and more efficient use of NRC and industry resources.

The regulation under paragraph 50.36(a)(1) of Title 10 of the *Code of Federal Regulations* (10 CFR) requires that:

> Each applicant for a license authorizing operation of a … utilization facility shall include in his application proposed technical

> specifications in accordance with the requirements of this section. A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications.

The regulation under 10 CFR 50.36(b) requires that:

> Each license authorizing operation of a … utilization facility … will include technical specifications. The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to [10 CFR] 50.34 ["Contents of applications; technical information"]. The Commission may include such additional technical specifications as the Commission finds appropriate.

The categories of items required to be in the TSs are listed in 10 CFR 50.36(c). The regulation at 10 CFR 50.36(c)(2) requires that TSs include LCOs. Per 10 CFR 50.36(c)(2)(i), LCOs "are the lowest functional capability or performance levels of equipment required for safe operation of the facility." The regulation also requires that when an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TS until the condition can be met.

The regulation at 10 CFR 50.62(b) defines an Anticipated Transient Without Scram (ATWS) as an anticipated operational occurrence as defined in appendix A of this part followed by the failure of the reactor trip portion of the protection system specified in General Design Criterion 20 of appendix A of this part.

The NRC staff's guidance for the review of TSs is in chapter 16.0, "Technical Specifications," of NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition" (SRP), March 2010 (ML100351425). As described therein, as part of the regulatory standardization effort, the NRC staff has prepared STSs for each of the LWR nuclear designs.

3.0 TECHNICAL EVALUATION

3.1 Deletion of Table 3.3.6.1-1, Function 5.d (NUREG-1433) and 4.l (NUREG-1434)

For the reduction of risk from an ATWS event for BWRs, 10 CFR 50.62(c)(4) states that the SLC system initiation must be automatic and must be designed to perform its function in a reliable manner for plants granted a construction permit after July 26, 1984, and for plants granted a construction permit prior to July 26, 1984, that have already been designed and built to include this feature. The TSTF stated, and the NRC staff confirmed, that there are no BWRs whose construction permits were issued after July 26, 1984, and no operating BWRs that credit automatic initiation of the SLC system. The SLC system is manually initiated by the plant operators as directed by the emergency operating procedures.

The TSTF stated that since the RWCU system isolation signal on SLC system initiation is a fail-close signal for the RWCU system return isolation valves, it complicates plant maintenance evolutions that interrupt power to the signal, resulting in isolation of the RWCU system. Isolation of the RWCU system has an undesirable effect on reactor coolant system chemistry. Restarting

the RWCU system is a lengthy process that requires warming the of system prior to starting the pump, typically requires control room and field actions, and diverts operator attention from more safety significant tasks. Further, shutdown and restart of the RWCU system increases wear on the pump motors. The RWCU system motors and pumps are typically replaced together as a unit requiring extensive maintenance being conducted in a high radiation area.

The NRC staff reviewed the proposal to eliminate automatic isolation of the RWCU system upon the initiation of the SLC system and determined the following:

- The RWCU system isolation signal is not designed to indicate any breach of RWCU system piping or components.
- The SLC system is not credited to mitigate any design basis accident (DBA).
- Following an ATWS event, the SLC system is manually initiated, and therefore a manual isolation of the RWCU system is acceptable because it will have a negligible effect on operator response to an ATWS event.
- Automatic RWCU system isolation on SLC initiation is not considered part of the primary success path for the mitigation of a DBA.
- During an ATWS event, the reactor water level would drop, and the reactor Level 2 signal would automatically isolate the RWCU system. This is a backup to the proposed procedurally-controlled, manual RWCU system isolation, and therefore removes the concern of the RWCU system removing SLC system-injected boron from the reactor vessel.
- For the plants that credit manual SLC system initiation following a LOCA for pH control, the RWCU system would be isolated by the containment isolation signal originating from the LOCA signal.
- The automatic RWCU system isolation function upon initiation of the SLC system does not satisfy any 10 CFR 50.36 criteria.
- When the SLC system is taken out of service (e.g., for maintenance), unnecessary automatic isolation of the RWCU system will be prevented.
- Unnecessary interruption of the RWCU system operation due to the ‘fail-close’ feature of the SLC system initiation signal complicates maintenance.

The NRC staff finds the proposal to eliminate automatic isolation of the RWCU system upon imitation of the SLC system acceptable based on the following NRC staff findings:

- The manual initiation of the SLC system during an ATWS event remains unchanged. A procedurally-controlled simultaneous manual isolation of the RWCU system during this event removes the concern of the RWCU system removing the SLC system-injected boron from the reactor vessel. Therefore, the specified acceptable fuel design limits will not be affected during an ATWS event, and 10 CFR 50.62(b) and GDC 20 continue to be met.
- The design of the SLC system as one of the two independent reactivity control systems for the mitigation of an ATWS event remains unchanged. Therefore, the specified acceptable fuel design limits will not be affected during an ATWS event and GDC 26 continues to be met.
- The regulation at 10 CFR 50.36(c)(2)(i) is met because STS 3.3.6.1 continues to provide remedial actions and shuts down the reactor if the remedial actions cannot be met.

3.2 Editorial Changes to TS 3.3.6.1

TSTF-584 proposed renumbering and deletion of Functions and Actions in NUREG-1433 and NUREG-1434, which are described above in section 2.2.

The NRC staff finds that these changes are acceptable because they are conforming changes resulting from the deletion of Table 3.3.6.1-1, Function 5.d (NUREG-1433) and Function 4.l (NUREG-1434), and do not alter the way the TS are implemented. Furthermore, the NRC staff finds this change is acceptable since it is editorial and provides the correct number sequence.

3.3 Consideration of Changes to the STS Bases

The NRC staff reviewed the proposed changes to the STS Bases of STS 3.3.6.1. The NRC staff finds the proposed STS Bases changes acceptable as they are editorial in nature and are consistent with the Final Policy Statement on TS and 10 CFR 50.36. Furthermore, the NRC staff review determined that the proposed STS Bases changes enhance and/or clarify the current STS Bases.

4.0 CONCLUSION

The NRC staff finds that the changes to STS 3.3.6.1 satisfy 10 CFR 50.36(c)(2)(i) and 10 CFR 50.62(b) because the specified acceptable fuel design limits will not be affected during an ATWS event and remedial actions to be taken until each LCO can be met continue to provide adequate protection to the public health and safety. Additionally, the NRC staff determined that the changes are technically clear and consistent with customary terminology and format in accordance with SRP chapter 16.0.

Therefore, the NRC staff concludes that all of the proposed changes in TSTF-584, Revision 0, are acceptable, and thus, approved.

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