NEXTera ENERGY
DUANE ARNOLD

February 8, 2018

NG-18-0015

10 CFR 50.90

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

Duane Arnold Energy Center
Docket No. 50-331

Subject: Response to Second Request for Additional Information Regarding License Amendment Request (TSCR-168), Application to Revise Technical Specifications to Adopt TSTF-542, "Reactor Pressure Vessel Water Inventory Control"

References:

1. NextEra Energy Duane Arnold, LLC letter NG-17-0093, "License Amendment Request (TSCR-168), Application to Revise Technical Specifications to Adopt TSTF-542, 'Reactor Pressure Vessel Water Inventory Control', " June 9, 2017 (ML17164A076)
2. NRC E-mail "Final Request for Additional Information - Duane Arnold Energy Center (DAEC) -Application to Revise Technical Specifications to Adopt TSTF-542, Revision 2, 'Reactor Pressure Vessel Water Inventory Control' - CAC No. MF9829," October 4, 2017 (ML17277A365)
3. NextEra Energy Duane Arnold, LLC letter NG-17-0207, "Response to Request for Additional Information Regarding License Amendment Request (TSCR-168), Application to Revise Technical Specifications to Adopt TSTF-542, 'Reactor Pressure Vessel Water Inventory Control'," November 1, 2017 (ML17305A910)
4. NRC E-mail "Second Round of Request for Additional Information - Duane Arnold Energy Center (DAEC) - LAR to Adopt TST-542, Revision 2, 'Reactor Pressure Vessel Water Inventory Control' - CAC No. MF9829 (EPID: L-2017-LLA-0243)," December 12, 2017

In Reference 1, as supplemented by Reference 3, NextEra Energy Duane Arnold, LLC (NextEra) submitted a license amendment request for Duane Arnold Energy Center. The proposed change replaces existing Technical Specifications (TS) requirements related to "operations with a potential for draining the reactor vessel" with new requirements on reactor pressure vessel water inventory control.

In Reference 4, the NRC staff requested additional information to support its review of the LAR. The Enclosure to this letter provides NextEra's response to the request for additional information (RAI).

Attachment 1 to the Enclosure provides marked up TS pages showing the revised proposed changes. These pages supersede the corresponding pages provided in References 1 and 3. Updated retyped TS pages, which supersede the corresponding pages in References 1 and 3, are provided in Attachment 2. Attachment 3 contains proposed changes to the TS Bases, provided for information only, which supersede the corresponding pages in Reference 1.

This RAI response does not alter the conclusions in Reference 1 that the change does not involve a significant hazards consideration pursuant to 10 CFR 50.92, and there are no significant environmental impacts associated with the change.

No new or revised commitments are included in this letter.

If you have any questions or require additional information, please contact J. Michael Davis, Licensing Manager, at 319-851-7032.

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

Executed on February 8, 2018

Dean Curtland
Site Director
NextEra Energy Duane Arnold, LLC

Enclosure

cc: Regional Administrator, USNRC, Region III,
Project Manager, USNRC, Duane Arnold Energy Center
Resident Inspector, USNRC, Duane Arnold Energy Center
A. Leek (State of Iowa)

ENCLOSURE

NextEra's Response to Request for Additional Information

NRC Request for Additional Information:

By application dated June 9, 2017 (Agencywide Documents Access and Management System ADAMS Accession No. ML17164A076, and supplemented by letter dated November 1, 2017, (ADAMS) Accession No. ML17305A910, NextEra Energy, LLC (NextEra), (the licensee) requested to adopt Technical Specifications Task Force (TSTF) Traveler TSTF-542, "Reactor Pressure Vessel Water Inventory Control," Revision 2, which changes the Technical Specifications (TSs) for Duane Arnold Energy Center (DAEC).

The NRC issued a Request for Addition Information (RAI) (ADAMS Accession No. ML17277A365) to the licensee on October 4, 2017. In a letter dated November 1, 2017, NextEra Energy responded to these questions (ADAMS Accession No. ML17305A910). The NRC staff has completed its review of the RAIs and has additional questions related to the responses. The requested additional information is listed below:

DAEC-RAI-7

NRC Follow-up question to DAEC-RAI-1 response:

The markup pages provided on the RAI response letter of TS related to DRAIN TIME definition replaced "TAF" with "T.S. 2.1.1.3 Safety Limit;" however, as stated in RAI-1, the changes to TAF has global effects on the LAR including, but not limited to; TS LCO 3.5.2. For example, there are two places in TS LOC 3.5.2 that 'TAF' is noted.

Justify why these sections, including TS LCO 3.5.2, do not need to be modified, or make appropriate changes to all sections.

NextEra Response

NextEra revised the proposed changes in TS 3.5.2 to replace "TAF" with "TS 2.1.1.3 Safety Limit." Similarly, references to "TAF" in the proposed changes to the TS Bases are replaced with "TS 2.1.1.3 Safety Limit." Revised markups of the TS pages, retyped TS pages, and changes to the TS Bases that incorporate this change are provided in the attachments to this enclosure.

DAEC-RAI-8

NRC Follow-up question to DAEC-RAI-3 response:

Although TSTF-542 SR 3.5.2.8 and proposed DAEC SR 3.5.2.6 both test ECCS spray/injection subsystem function, they are not equivalent tests. The intent of TSTF-542 SR 3.5.2.8 is to verify that the required ECCS subsystem actuates on a manual initiation signal, including pump start and

realignment of all valves to their required positions. Where a manual initiation push button and logic are not available, an alternative is required to meet the intent of this testing (i.e., to verify that the required ECCS spray/injection subsystem can be manually operated.) The proposed DAEC SR 3.5.2.6 requires testing the flow of water through the recirculation line, but does not require testing for operability of the injection valves.

Please provide the following: 1) Describe how verification of operability is obtained for the ECCS spray/injection subsystem valves, which are normally closed during Modes 4 and 5; and 2) identify the SR in which the requirements are contained.

NextEra Response

NextEra proposes to add new SR 3.5.2.8 to DAEC TS 3.5.2, which will accomplish the intent of SR 3.5.2.8 in TSTF-542. The SR will verify the required ECCS injection/spray subsystem, including the associated pump and valves, can be manually operated. The surveillance frequency will be in accordance with the Surveillance Frequency Control Program with an initial frequency of 24 months (once per refueling cycle). The attachments to this enclosure provide revised markups of the TS pages, retyped TS pages, and changes to the TS Bases that include the addition of new SR 3.5.2.8.

ATTACHMENT 1 to NG-18-0015

Proposed Technical Specification Change (Mark-Up)

3 pages follow

DRAIN TIME of RPV water inventory to the TS 2.1.1.3 Safety Limit shall be ≥ 36 hours.

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AND

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One

RPV Water Inventory Control

~~ECCS — Shutdown~~ 3.5.2

, RPV WATER INVENTORY CONTROL, AND

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

3.5.2 ~~ECCS — Shutdown~~ Reactor Pressure Vessel (RPV) Water Inventory Control

LCO 3.5.2 ~~Two~~ low pressure ECCS subsystem~~s~~ shall be OPERABLE.

APPLICABILITY: ~~MODE 4,~~ MODES 4 and 5
~~MODE 5, except with the spent fuel storage pool gates removed and water level ≥ 21 ft 1 inch over the top of the reactor pressure vessel flange.~~

ACTIONS

Required CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ~~One required~~ ECCS subsystem inoperable.	A.1 Restore required ECCS subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 ~~Initiate action to suspend Operations With a Potential for Draining the Reactor Vessel (OPDRVs).~~ Initiate action to establish a method of water injection capable of operating without offsite electrical power.	Immediately
~~C. Both required ECCS subsystems inoperable.~~	~~C.1 Initiate action to suspend OPDRVs.~~ ~~AND~~ ~~C.2 Restore one ECCS subsystem to OPERABLE status.~~	~~Immediately~~ ~~4 hours~~

INSERT C (3.5.2)

(continued)

INSERT D (3.5.2)

D. DRAIN TIME < 8 hours.	D.1	---------- NOTE ---------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. ----------	
		Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > ~~TAF~~ for ≥ 36 hours.	Immediately
	AND		
	D.2	Initiate action to establish secondary containment boundary.	Immediately
	AND		
	D.3	Initiate action to isolate each secondary containment penetration flow path or verify it can be manually isolated from the control room.	Immediately
	AND		
	D.4	Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.	Immediately
E. Required Action and associated Completion Time of Condition C or D not met. OR DRAIN TIME < 1 hour.	E.1	Initiate action to restore DRAIN TIME to ≥ 36 hours.	Immediately

TS 2.1.1.3 Safety Limit

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.5.2.~~5~~ ~~Verify each required ECCS pump develops the specified flow rate against a system head corresponding to the specified reactor pressure.~~ ~~SYSTEM / FLOW RATE / NO. OF PUMPS / SYSTEM HEAD CORRESPONDING TO A REACTOR PRESSURE OF~~ ~~CS / ≥ 2718 gpm / 1 / ≥ 113 psig~~ ~~LPCI / ≥ 4320 gpm / 1 / ≥ 20 psig~~	In accordance with the ~~INSERVICE TESTING~~ PROGRAM
~~SR 3.5.2.6~~ ~~NOTES~~ ~~1. Vessel injection/spray may be excluded.~~ ~~2. For the LPCI System, the surveillance may be met by any series of sequential and/or overlapping steps, such that the LPCI Loop Select function is tested.~~ ~~Verify each required ECCS subsystem actuates on an actual or simulated automatic initiation signal.~~	~~In accordance with the Surveillance Frequency Control Program~~

Operate the required ECCS subsystem through the recirculation line for ≥ 10 minutes.

6

Surveillance Frequency Control

SR 3.5.2.7 Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.

In accordance with the Surveillance Frequency Control Program

SR 3.5.2.8 ----------NOTE----------
Vessel injection/spray may be excluded

Verify the required ECCS injection/spray subsystem can be manually operated.

In accordance with the Surveillance Frequency Control Program

ATTACHMENT 2 to NG-18-0015

Revised Technical Specification Pages

3 pages follow

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

3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control

LCO 3.5.2 DRAIN TIME of RPV water inventory to the TS 2.1.1.3 Safety Limit shall be $\geq$ 36 hours.

AND

One low pressure ECCS subsystems shall be OPERABLE.

APPLICABILITY: MODES 4 and 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required ECCS subsystem inoperable.	A.1 Restore required ECCS subsystem to OPERABLE status.	4 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Initiate action to establish a method of water injection capable of operating without offsite electrical power.	Immediately

(continued)

ACTIONS (Continued)

D.	DRAIN TIME < 8 hours.	C.1 ---------- NOTE ---------- Required ECCS injection/spray subsystem or additional method of water injection shall be capable of operating without offsite electrical power. ---------- Initiate action to establish an additional method of water injection with water sources capable of maintaining RPV water level > TS 2.1.1.3 Safety Limit for ≥ 36 hours.	Immediately
		AND C.2 Initiate action to establish secondary containment boundary.	Immediately
		AND D.3 Initiate action to isolate each secondary containment penetration flow path or verify it can be manually isolated from the control room.	Immediately
		AND D.4 Initiate action to verify one standby gas treatment subsystem is capable of being placed in operation.	Immediately

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.5.2.6	Operate the required ECCS subsystem through the recirculation line for ≥ 10 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.5.2.7	Verify each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated isolation signal.	In accordance with the Surveillance Frequency Control Program
SR 3.5.2.8	----------NOTE---------- Vessel injection/spray may be excluded. ---------- Verify the required ECCS injection/spray subsystem can be manually operated.	In accordance with the Surveillance Frequency Control Program

ATTACHMENT 3 to NG-18-0015

Proposed Technical Specification Bases Changes (Mark-Up)

11 pages follow

B 3.3 INSTRUMENTATION

B 3.3.5.2 Reactor Pressure Vessel (RPV) Water Inventory Control Instrumentation

BASES

TS 2.1.1.3 Safety Limit

BACKGROUND

The RPV contains penetrations below the ~~top of the active fuel (TAF)~~ that have the potential to drain the reactor coolant inventory to below the ~~TAF~~. If the water level should drop below the ~~TAF~~, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures.

Technical Specifications are required by 10 CFR 50.36 to include limiting safety system settings (LSSS) for variables that have significant safety functions. LSSS are defined by the regulation as "Where a LSSS is specified for a variable on which a safety limit has been placed, the setting must be chosen so that automatic protective actions will correct the abnormal situation before a Safety Limit (SL) is exceeded." The Analytical Limit is the limit of the process variable at which a safety action is initiated to ensure that a SL is not exceeded. Any automatic protection action that occurs on reaching the Analytical Limit therefore ensures that the SL is not exceeded. However, in practice, the actual settings for automatic protection channels must be chosen to be more conservative than the Analytical Limit to account for instrument loop uncertainties related to the setting at which the automatic protective action would actually occur. The actual settings for the automatic isolation channels are the same as those established for the same functions in MODES 1, 2, and 3 in LCO 3.3.5.1, "Emergency Core Cooling System (ECCS) Instrumentation," or LCO 3.3.6.1, "Primary Containment Isolation instrumentation".

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material should a draining event occur. Under the definition of DRAIN TIME, some penetration flow paths may be excluded from the DRAIN TIME calculation if they will be isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the ~~TAF~~ when actuated by RPV water level isolation instrumentation.

TS 2.1.1.3 Safety Limit

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

provided to limit reactor vessel inventory loss during the startup of the Residual Heat Removal (RHR) shutdown cooling mode.

The Pump Discharge Flow - Low Allowable Values are high enough to ensure that the pump flow rate is sufficient to protect the pump, yet low enough to ensure that the closure of the minimum flow valve is initiated to allow full flow into the core.

One channel of the Pump Discharge Flow - Low Function is required to be OPERABLE in MODES 4 and 5 when the associated Core Spray or LPCI pump is required to be OPERABLE by LCO 3.5.2 to ensure the subsystem is capable of injecting into the Reactor Pressure Vessel when manually initiated.

RHR System Isolation

3.a - Reactor Vessel Water Level - Low

TS 2.1.1.3 Safety Limit

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the ~~TAF~~ when actuated by RPV water level isolation instrumentation. The Reactor Vessel Water Level - Low Function associated with RHR System isolation may be credited for automatic isolation of penetration flow paths associated with the RHR System.

Reactor Vessel Water Level - Low signals are initiated from four level indicating switches that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Reactor Vessel Water Level - Low Allowable Value was chosen to be the same as the Primary Containment Isolation Instrumentation Reactor Vessel Water Level - Low Allowable Value (LCO 3.3.6.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 4 valves.

Reactor Water Cleanup (RWCU) System Isolation

4.a - Reactor Vessel Water level - Low Low

TS 2.1.1.3 Safety Limit

The definition of Drain Time allows crediting the closing of penetration flow paths that are capable of being isolated by valves that will close automatically without offsite power prior to the RPV water level being equal to the ~~TAF~~ when actuated by RPV water level isolation instrumentation. The Reactor Vessel Water Level - Low Low Function associated with RWCU System isolation may be credited for automatic isolation of penetration flow paths associated with the RWCU System.

Reactor Vessel Water Level - Low Low signals are initiated from four level indicating switches that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. While four channels (two channels per trip system) of the Reactor Vessel Water Level - Low Function are available, only two channels (all in the same trip system) are required to be OPERABLE.

The Reactor Vessel Water Level - Low Low Allowable Value was chosen to be the same as the ECCS Reactor Vessel Water Level - Low Low Allowable Value (LCO 3.3.5.1), since the capability to cool the fuel may be threatened.

The Reactor Vessel Water Level - Low Low Function is only required to be OPERABLE when automatic isolation of the associated penetration flow path is credited in calculating DRAIN TIME.

This Function isolates the Group 5 valves.

INSERT B-1 (3.5.2 Analyses)

With the unit in MODE 4 or 5, RPV water inventory control is not required to mitigate any events or accidents evaluated in the safety analyses. RPV water inventory control is required in MODES 4 and 5 to protect Safety Limit 2.1.1.3 and the fuel cladding barrier to prevent the release of radioactive material to the environment should an unexpected draining event occur.

A double-ended guillotine break of the Reactor Coolant System (RCS) is not postulated in MODES 4 and 5 due to the reduced RCS pressure, reduced piping stresses, and ductile piping systems. Instead, an event is considered in which single operator error or initiating event allows draining of the RPV water inventory through a single penetration flow path with the highest flow rate, or the sum of the drain rates through multiple penetration flow paths susceptible to a common mode failure (e.g., seismic event, loss of normal power, single human error). It is assumed, based on engineering judgment, that while in MODES 4 and 5, one low pressure ECCS injection/spray subsystem can maintain adequate reactor vessel water level.

As discussed in References 1, 2, 3, 4, and 5, operating experience has shown RPV water inventory to be significant to public health and safety. Therefore, RPV Water Inventory Control satisfies Criterion 4 of 10 CFR 50.36(c)(2)(ii).

INSERT B-2 (3.5.2 LCO)

The RPV water level must be controlled in MODES 4 and 5 to ensure that if an unexpected draining event should occur, the reactor coolant water level remains above the top of the active irradiated fuel as required by Safety Limit 2.1.1.3

The Limiting Condition for Operation (LCO) requires the DRAIN TIME of RPV water inventory to the ~~TAF~~ to be ≥ 36 hours. A DRAIN TIME of 36 hours is considered reasonable to identify and initiate action to mitigate unexpected draining of reactor coolant. An event that could cause loss of RPV water inventory and result in the RPV water level reaching the ~~TAF~~ in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

TS 2.1.1.3 Safety Limit

One low pressure ECCS injection/spray subsystem is required to be OPERABLE and capable of being manually started to provide defense-in-depth should an unexpected draining event occur. A low pressure ECCS injection/spray subsystem consists of either one Core Spray (CS) subsystem or one Low Pressure Coolant Injection (LPCI) subsystem. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or condensate storage tank (CST) to the RPV. Each LPCI subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool to the RPV. In MODES 4 and 5, the RHR System cross tie valve is not required to be closed.

The LCO is modified by a Note which allows a required LPCI subsystem to be considered OPERABLE during alignment and operation for decay heat removal if capable of being manually realigned (remote or local) to the LPCI mode and is not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. This allowance is necessary since the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Because of the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the ~~TAF~~.

INSERT B-3 (3.5.2 ACTIONS)

A.1 and B.1

If the required low pressure ECCS injection/spray subsystem is inoperable, it must be restored to OPERABLE status within 4 hours. In this Condition, the LCO controls on DRAIN TIME minimize the possibility that an unexpected draining event could necessitate the use of the ECCS injection/spray subsystem, however the defense-in-depth provided by the ECCS injection/spray subsystem is lost. The 4 hour Completion Time for restoring the required low pressure ECCS injection/spray subsystem to OPERABLE status is based on engineering judgment that considers the LCO controls on DRAIN TIME and the low probability of an unexpected draining event that would result in loss of RPV water inventory.

If the inoperable ECCS injection/spray subsystem is not restored to OPERABLE status within the required Completion Time, action must be initiated immediately to establish a method of water injection capable of operating without offsite electrical power. The method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The method of water injection may be manually initiated and may consist of one or more systems or subsystems, and must be able to access water inventory capable of maintaining the RPV water level above the ~~TAF~~ for ≥ 36 hours. If recirculation of injected water would occur, it may be credited in determining the necessary water volume.

TS 2.1.1.3 Safety Limit

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

With the DRAIN TIME less than 36 hours but greater than or equal to 8 hours, compensatory measures should be taken to ensure the ability to implement mitigating actions should an unexpected draining event occur. Should a draining event lower the reactor coolant level to below the ~~TAF~~, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The secondary containment provides a controlled volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action C.1 requires verification of the capability to establish the secondary containment boundary in less than the DRAIN TIME. The required verification confims actions to establish the secondary containment boundary are preplanned and necessary materials are available. The secondary containment boundary is considered established when one Standby Gas Treatment (SBGT) subsystem is capable of maintaining a negative pressure in the secondary containment with respect to the environment.

Verification that the secondary containment boundary can be established must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment. Secondary containment penetration flow paths form a part of the secondary containment boundary. Required Action C.2 requires verification of the capability to isolate each secondary containment penetration flow path in less than the DRAIN TIME. The required verification confirms actions to isolate the secondary containment penetration flow paths are preplanned and necessary

materials are available. Power operated valves are not required to receive automatic isolation signals if they can be closed manually within the required time. Verification that the secondary containment penetration flow paths can be isolated must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

One SBGT subsystem is capable of maintaining the secondary containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action C.3 requires verification of the capability to place one SBGT subsystem in operation in less than the DRAIN TIME. The required verification confirms actions to place a SBGT subsystem in operation are preplanned and necessary materials are available. Verification that a SBGT subsystem can be placed in operation must be performed within 4 hours. The required verification is an administrative activity and does not require manipulation or testing of equipment.

D.1, D.2, D.3, and D.4

With the DRAIN TIME less than 8 hours, mitigating actions are implemented in case an unexpected draining event should occur. Note that if the DRAIN TIME is less than 1 hour, Required Action E.1 is also applicable.

Required Action D.1 requires immediate action to establish an additional method of water injection augmenting the ECCS injection/spray subsystem required by the LCO. The additional method of water injection includes the necessary instrumentation and controls, water sources, and pumps and valves needed to add water to the RPV or refueling cavity should an unexpected draining event occur. The Note to Required Action D.1 states that either the ECCS injection/spray subsystem or the additional method of water injection must be capable of operating without offsite electrical power. The additional method of water injection may be manually initiated and may consist of one or more systems or subsystems. The additional method of water injection must be able to access water inventory capable of being injected to maintain the RPV water level above the ~~TAF~~ for ≥ 36 hours. The additional method of water injection and the ECCS injection/spray subsystem may share all or part of the same water sources. If recirculation of injected water would occur, it may be credited in determining the required water volume.

TS 2.1.1.3 Safety Limit

Should a draining event lower the reactor coolant level to below the ~~TAF~~, there is potential for damage to the reactor fuel cladding and release of radioactive material. Additional actions are taken to ensure that radioactive material will be contained, diluted, and processed prior to being released to the environment.

The secondary containment provides a control volume in which fission products can be contained, diluted, and processed prior to release to the environment. Required Action D.2 requires that actions be immediately initiated to establish the secondary containment boundary. With the secondary containment boundary established, one SBGT subsystem is capable of maintaining a negative pressure in the secondary containment with respect to the environment.

The secondary containment penetrations form a part of the secondary containment boundary. Required Action D.3 requires that actions be immediately initiated to verify that each secondary containment penetration flow path is isolated or to verify that it can be manually isolated from the control room.

One SBGT subsystem is capable of maintaining the secondary containment at a negative pressure with respect to the environment and filter gaseous releases. Required Action D.4 requires that actions be immediately initiated to verify that at least one SBGT subsystem is capable of being placed in operation. The required verification is an administrative activity and does not require manipulation or testing of equipment.

E.1

If the Required Actions and associated Completion times of Conditions C or D are not met or if the DRAIN TIME is less than 1 hour, actions must be initiated immediately to restore the DRAIN TIME to ≥ 36 hours. In this condition, there may be insufficient time to respond to an unexpected draining event to prevent the RPV water inventory from reaching the ~~TAF~~. Note that Required Actions D.1, D.2, D.3, and D.4 are also applicable when DRAIN TIME is less than ~~1 hour~~.

TS 2.1.1.3 Safety Limit

INSERT B-4 (SR3.5.2.1)

This Surveillance verifies that the DRAIN TIME of RPV water inventory to the ~~TAF~~ is ≥ 36 hours. The period of 36 hours is considered reasonable to identify and initiate action to mitigate draining of reactor coolant. Loss of RPV water inventory that would result in the RPV water level reaching the ~~TAF~~ in greater than 36 hours does not represent a significant challenge to Safety Limit 2.1.1.3 and can be managed as part of normal plant operation.

The definition of DRAIN TIME states that realistic cross-sectional areas and drain rates are used in the calculation. A realistic drain rate may be determined using a single, step-wise, or integrated calculation considering the changing RPV water level during a draining event. For a Control Rod RPV penetration flow path with the Control Rod Drive Mechanism removed and not replaced with a blank flange, the realistic cross-sectional area is based on the control rod blade seated in the control rod guide tube. If the control rod blade will be raised from the penetration to adjust or verify seating of the blade, the exposed cross-sectional area of the RPV penetration flow path is used.

The definition of DRAIN TIME excludes from the calculation those penetration flow paths connected to an intact closed system, or isolated by manual or automatic valves that are locked, sealed, or otherwise secured in the closed position, blank flanges, or other devices that prevent flow of reactor coolant through the penetration flow paths. A blank flange or other bolted device must be connected with a sufficient number of bolts to prevent draining in the event of an Operating Basis Earthquake. Normal or expected leakage from closed systems or past isolation devices is permitted. Determination that a system is intact and closed or isolated must consider the status of branch lines and ongoing plant maintenance and testing activities.

The Residual Heat Removal (RHR) Shutdown Cooling System is only considered an intact closed system when misalignment issues (Reference 6) have been precluded by functional valve interlocks or by isolation devices, such that redirection of RPV water out of an RHR subsystem is precluded. Further, RHR Shutdown Cooling System is only considered an intact closed system if its controls have not been transferred to Remote Shutdown, which disables the interlocks and isolation signals.

The exclusion of penetration flow paths from the determination of DRAIN TIME must consider the potential effects of a single operator error or initiating event on items supporting maintenance and testing (rigging, scaffolding, temporary shielding, piping plugs, snubber removal, freeze seals, etc.). If failure of such items could result and would cause a draining event from a closed system or between the RPV and the isolation device, the penetration flow path may not be excluded from the DRAIN TIME calculation.

Surveillance Requirement 3.0.1 requires SRs to be met between performances. Therefore, any changes in plant conditions that would change the DRAIN TIME requires that a new DRAIN TIME be determined.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

INSERT B-5 (SR 3.5.2.6-8)

SR 3.5.2.6

Verifying that the required ECCS injection/spray subsystem can be manually started and operate for at least 10 minutes demonstrates that the subsystem is available to mitigate a draining event. Testing the ECCS injection/spray subsystem through the recirculation line is necessary to avoid overfilling the refueling cavity. The minimum operating time of 10 minutes was based on engineering judgment. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.7

TS 2.1.1.3 Safety Limit

Verifying that each valve credited for automatically isolating a penetration flow path actuates to the isolation position on an actual or simulated RPV water level isolation signal is required to prevent RPV water inventory from dropping below the ~~TAF~~ should an unexpected draining event occur. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.5.2.8

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The required ECCS subsystem must be capable of being manually operated. This Surveillance verifies that the required ECCS injection/spray subsystem, including the associated pump and valves, can be manually operated.

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The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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This SR is modified by a Note that excludes vessel injection/spray during the Surveillance. Since all active components are testable and full flow can be demonstrated by recirculation through the test line, coolant injection into the RPV is not required during the Surveillance.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS) AND REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM

B 3.5.2 ~~ECCS — Shutdown~~ Reactor Pressure Vessel (RPV) Water Inventory Control

BASES

BACKGROUND

~~A description of the Core Spray (CS) System is provided in the Bases for LCO 3.5.1, "ECCS Operating".~~

~~The Low Pressure Coolant Injection (LPCI) Mode of the Residual Heat Removal (RHR) System, for the application of this specification, takes on a different definition than is described in the Bases for LCO 3.5.1 "ECCS Operating". In the application of "ECCS Shutdown", the low pressure ECCS subsystems consist of two CS subsystems and two LPCI subsystems. Each LPCI subsystem consists of one motor driven RHR pump, piping, and valves to transfer water from the suppression pool to the Reactor Pressure Vessel (RPV). Only a single RHR pump is required per subsystem because of the larger injection capacity in relation to a CS subsystem.~~

The RPV contains penetrations below the TS 2.1.1.3 Safety Limit that have the potential to drain the reactor coolant inventory to below the TS 2.1.1.3 Safety Limit. If the water level should drop below the TS 2.1.1.3 Safety Limit, the ability to remove decay heat is reduced, which could lead to elevated cladding temperatures and clad perforation. Safety Limit 2.1.1.3 requires the RPV water level to be above the top of the active irradiated fuel at all times to prevent such elevated cladding temperatures

APPLICABLE SAFETY ANALYSES

INSERT B-1 (3.5.2 Analyses)

~~The ECCS performance is evaluated for the entire spectrum of break sizes for a postulated Loss of Coolant Accident (LOCA). The long term cooling analysis following a design basis LOCA (Ref. 1) demonstrates that only one low pressure ECCS pump is required, post LOCA, to maintain adequate reactor vessel water level. It is reasonable to assume, based on engineering judgement, that while in MODES 4 and 5, one low pressure ECCS subsystem can maintain adequate reactor vessel water level. To provide redundancy, a minimum of two low pressure ECCS subsystems are required to be OPERABLE in MODES 4 and 5.~~

~~The low pressure ECCS subsystems satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii).~~

LCO

INSERT B-2 (3.5.2 LCO)

~~Two low pressure ECCS subsystems are required to be OPERABLE. For this specification, the low pressure ECCS subsystems consist of two CS subsystems and two LPCI subsystems. Each CS subsystem consists of one motor driven pump, piping, and valves to transfer water from the suppression pool or Condensate Storage Tank (CST) to the Reactor Pressure~~

(continued)

BASES

5

SURVEILLANCE REQUIREMENTS

SR 3.5.2.4 (continued)

valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to manual valves unless the valves are being manipulated to serve as all or part of a system vent flow path opened under administrative control, as described in the SR Note (and Bases paragraph below). In this case, the SR Note allows the licensee to credit administratively controlled manual action to close the system vent flow path in order to maintain system Operability during system venting and performance of the gas accumulation SR. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. The Frequency is appropriate because the valves are operated under procedural control and the probability of their being mispositioned during this time period is low.

The Surveillance is modified by a Note which exempts system vent flow paths opened under administrative control. The administrative control should be proceduralized and include a stationing of a dedicated individual at the system vent flow path who is in continuous communication with the operators in the control room. This individual will have a method to rapidly close the system vent flow path if directed.

a required

In Modes 4 and 5, the RHR System may be required to operate in the shutdown cooling mode to remove decay heat and sensible heat from the reactor. Therefore, this SR is modified by a Note that allows ~~one~~ LPCI subsystem to be considered OPERABLE during alignment and operation for decay heat removal, if capable of being manually realigned (remote or local) to the LPCI mode and not otherwise inoperable. Alignment and operation for decay heat removal includes when the required RHR pump is not operating or when the system is realigned from or to the RHR shutdown cooling mode. Because of ~~the low pressure and low temperature conditions in Modes 4 and 5, sufficient time will be available to manually align and initiate LPCI subsystem operation to provide core coverage prior to postulated fuel uncovery. This will ensure adequate core cooling if an inadvertent RPV draindown should occur.~~

the restrictions on DRAIN TIME, sufficient time will be available following an unexpected draining event to manually align and initiate LPCI subsystem operation to maintain RPV water inventory prior to the RPV water level reaching the TS 2.1.1.3 Safety Limit.

INSERT B-5 (SR 3.5.2.6-8)

INSERT B-6 (3.5.2 REF)

REFERENCES

~~1. UFSAR, Section 15.2.1.1.~~

In the unlikely event of any primary system leak that could result in draining the RPV,

BASES

APPLICABLE SAFETY ANALYSES (continued)

these requirements will conservatively limit radiation releases to the environment.

makeup

~~Hydrostatic and leak testing, in and of themselves, are not considered to be Operations with the Potential for Draining the Reactor Vessel (OPDRVs). However, in the event of a large primary system leak~~, the reactor vessel would rapidly depressurize~~, allowing the low pressure core cooling systems to operate~~. The capability ~~of the low pressure coolant injection and core spray subsystems, as~~ required in MODE 4 by LCO 3.5.2, "~~ECCS — Shutdown~~," would be more than adequate to keep the ~~core flooded~~ under this low decay heat load condition. Small system leaks would be detected by leakage inspections before significant inventory loss occurred.

RPV Water Inventory Control

RPV water level above the TS 2.1.1.3 Safety Limit

For the purposes of this test, the protection provided by normally required MODE 4 applicable LCOs, in addition to the secondary containment requirements required to be met by this Special Operations LCO, will ensure acceptable consequences during normal hydrostatic test conditions and during postulated accident conditions.

As described in LCO 3.0.7, compliance with Special Operations LCOs is optional, and therefore, no criteria of 10 CFR 50.36(c)(2)(ii) apply. Special Operations LCOs provide flexibility to perform certain operations by appropriately modifying requirements of other LCOs. A discussion of the criteria satisfied for the other LCOs is provided in their respective Bases.

LCO

As described in LCO 3.0.7, compliance with this Special Operations LCO is optional. Operation at reactor coolant temperatures > 212°F can be in accordance with Table 1.1-1 for MODE 3 operation without meeting this Special Operations LCO or its ACTIONS. This option may be required due to P/T limits, however, which require testing at temperatures > 212°F, while some system leakage or hydrostatic testing may require the safety/relief valves to be gagged, preventing their OPERABILITY. Additionally, even with required minimum reactor coolant temperature ≤ 212°F, RCS temperatures may drift above 212°F during the performance of system leakage and hydrostatic testing or during subsequent control rod scram time testing, which is typically performed in conjunction with a system leakage or hydrostatic test. While this Special Operations LCO is provided for system leakage and hydrostatic testing, and for scram time testing initiated in conjunction with a system leakage or

(continued)