

NRC Pre-Submittal Meeting

Braidwood LAR for Ultimate Heat Sink

Giovanni Panici, Exelon
Darrel Riedinger, Exelon
Dwi Murray, Exelon
Phillip Henderson, Exelon
Kevin Lueshen, Exelon

May 12, 2021



Agenda

- Background
- Braidwood Ultimate Heat Sink (UHS) Plan
- Braidwood TS 3.7.9 Proposed Changes
- Braidwood UHS Evaluation
- Timeline for Submittal
- Summary

Background

- Past summer meteorological and atmospheric conditions have resulted in the Technical Specifications (TS) 3.7.9 - Ultimate Heat Sink (UHS) temperature limit being challenged. These conditions include elevated air temperatures, high humidity, and low wind speed.
- It is expected that the UHS temperature limit will continue to be challenged in the future and Braidwood Station plans to implement short-term and long-term licensing actions to address this condition.
- Current Braidwood TS 3.7.9, “Ultimate Heat Sink,” does not contain an Action to restore the UHS temperature to within limit and requires a unit shutdown when UHS temperature exceeds the limit.

Short Term Action

- License Amendment Request (LAR) to raise TS 3.7.9 Surveillance Requirement (SR) 3.7.9.2 for UHS average water temperature from 102°F to 102.8°F.
- The temperature change was approved as a temporary increase until September 30th, 2020 (ML20245E419).
- LAR would temporarily increase UHS average water temperature from 102°F to 102.8°F to support Summer 2021 plant operations.

Short Term Action (continued)

Braidwood TS Surveillance Requirement (SR) 3.7.9.2

- Current SR wording:
 - “Verify average water temperature of the UHS is <102.8°F until September 30, 2020. After September 30, 2020, verify average water temperature of UHS is <102°F.”
- Proposed SR wording:
 - “Verify average water temperature of the UHS is <102.8°F until September 30, 2021. After September 30, 2021, verify average water temperature of UHS is <102°F.”

Long Term Action

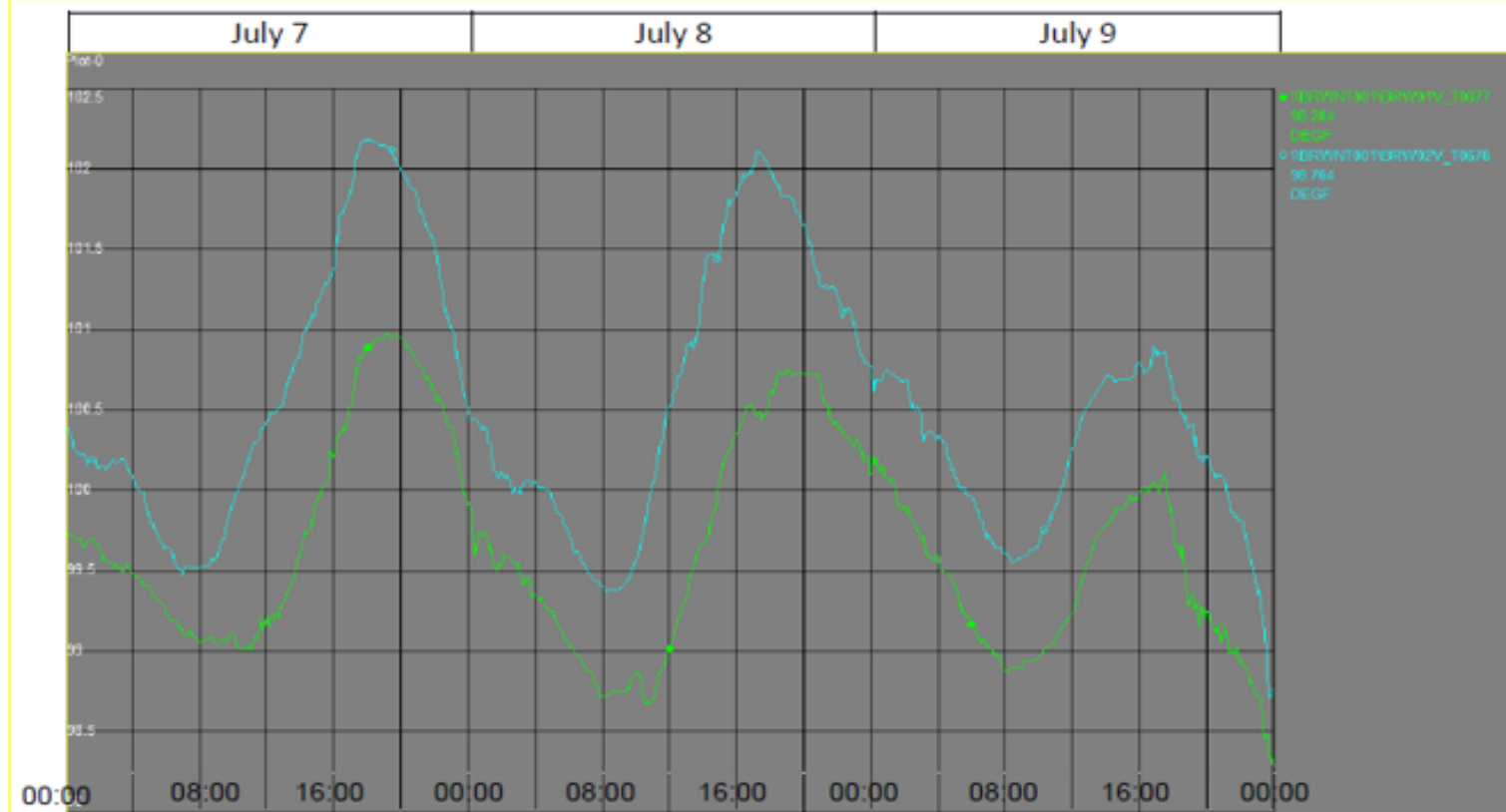
- License Amendment Request to propose the following to TS 3.7.9:
 - Add an Action to the UHS TS that addresses a Condition where UHS temperature exceeds SR limit
 - Required Action would restore the UHS temperature to within the SR limit with an associated Completion Time
- Similar to Pressurized Water Reactor Owners Group (PWROG) conceptual program for temporary relaxation of UHS peak temperature SR (ML20223A015) - August 17, 2020.

Long Term Action (continued)

- Basis for the proposed:
 - The UHS temperature would be potentially exceeded for short periods of time
 - A dual unit shutdown should not be required due to exceeding UHS temperature for a short period of time
 - The licensing and design basis Containment analysis of record (AOR) is based on conservative assumptions

Long Term Action (continued)

UHS Maximum Temperature – Year 2020



The temperatures are taken at the discharge of the running SX pumps:

- 1V_T0677 1B SX Pump
- 2V_T0676 2A SX Pump

The computer points read higher than the precise instrumentation used locally. The maximum average temperature for the UHS was recorded as 101.15 °F (101 °F for 1B SX and 101.3 °F for 2A SX) at 18:30 on 7/7/2020

Long Term Action (continued)

- Potential short-term UHS temperature excursions that exceed the current TS SR limit can be offset by margins available in some of the inputs/assumptions made in the analysis of record.
- The margin evaluation will be similar in concept to the previously evaluated available margins for raising the SR 3.7.9.2 value from 102°F to 102.8°F in 2020.

Braidwood TS 3.7.9 Proposed Changes

- The proposed amendment would add a new Required Action A.1 to “Verify UHS temperature at or below the maximum analyzed temperature limit,” with a Completion Time of “Immediately” to the current Condition A, which states “UHS inoperable due to average water temperature.”
- The proposed amendment would also add a new Required Action A.2 to “Restore UHS average water temperature to within limit,” with a Completion Time 7 days to the current Condition A.

Braidwood TS 3.7.9 Proposed Changes (continued)

- The current TS 3.7.9 Actions for Condition A states:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. UHS inoperable due to average water temperature.	A.1 Be in MODE 3.	12 hours
	<u>AND</u>	
	A.2 Be in MODE 5.	36 hours

Braidwood TS 3.7.9 Proposed Changes (continued)

- The proposed TS 3.7.9 Actions for Condition A would state:

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. UHS inoperable due to average water temperature.	A.1 Verify UHS average water temperature at or below the maximum analyzed temperature limit.	Immediately
	<u>AND</u>	
	A.2 Restore UHS average water temperature to within limit.	7 days
	<u>OR</u>	
	A.3 Be in MODE 3.	12 hours
	<u>AND</u>	
	A.4 Be in MODE 5.	36 hours

Braidwood Proposed UHS Evaluations

- Evaluations and analyses will be documented to support Required Action A.1 in demonstrating that the plant's safety related equipment will maintain its design function at the higher UHS temperature through the Completion Time.
- The required evaluations and analyses will credit existing margins to offset the increase in UHS temperature above the SR limit.
- The proposed changes would not impact Braidwood's licensing basis analyses.

Braidwood Proposed UHS Evaluations

Technical Evaluation will address the following areas similar to the 102.8° F temporary limit approved in 2020.

Accident Operations

- Equipment Supported by essential service water (SX)
- Impact on Accident Analyses
 - Containment Integrity (loss of coolant accident (LOCA), main steam line break)
 - LOCA - Peak Clad Temperature
 - Non-LOCA Analyses

Normal Operations

- Component Cooling (CC) to the Reactor Coolant Pumps (RCP)

Other Analyses

- Diesel Driven Auxiliary Feed (AF) Pump Operation Support (Loss of All AC Power)
- Generic Letter 96-06 Response

Accident Operations – Existing Margins

- Equipment Supported by SX
 - Cubicle Coolers, Pump Oil Coolers, Emergency Diesel Generator Jacket Water Heat Exchanger , Component Cooling Heat Exchanger
 - Analyses use SX Temp 106° F
- Accident Analysis - Containment Integrity
 - Reactor Containment Fan Cooler (RCFC) Heat Removal Curve Used:
 - SX Temp 104° F (Conservative for Time of Max Temperature, Pressure)
 - Tube Plugging 10% vs < 2% Actual
- Accident Analysis - LOCA - Peak Clad Temperature
 - New Licensing Basis - Full Spectrum LOCA Methodology
 - Unit 1 - Implemented April 2021
 - Unit 2 - Implementation Fall 2021
 - Analysis Results are not impacted by the higher SX Temperature
- Non-LOCA Analyses - AF Assumptions

Normal Operation

Plant procedures direct adjusting CC and SX flow rates to limit exceeding the CC operating limit of 105° F .

- CC to the RCPs
 - Typical RCP motor bearing temperatures during normal plant operation, approximately 130° F to 165° F, are significantly below the operational limit of 195° F.
 - Shutdown criteria for the RCPs bearing temperatures will remain in effect so that the higher SX temperature will not have any adverse effects on the RCPs and their operation.

Plant procedures document the current maximum analyzed UHS temperature limit.

- Shiftly operating surveillances and LCO administrative procedures document the UHS temperature limit and reference the applicable technical evaluation.

Other Analyses

- GL 96-06
Current evaluation performed for SX at 105° F for water hammer after SX pumps restart following a LOCA or MSLB concurrent with a Loss Of Offsite Power Event
- Diesel Driven AF Operation on Loss of All AC Power
Current analysis results support SX at 104° F for SX Booster Pump Operation when the main SX pumps are not running

Timeline for Submittal

- Submittal of LAR for UHS temporary temperature increase to 102.8° F in SR 3.7.9.2 - May 2021
- Submittal of LAR for crediting existing margins to offset temporary increase in UHS temperature above SR 3.7.9.2 limit in TS 3.7.9 - Third quarter 2021

Summary

- Short-term UHS temperature excursions that exceed the current TS SR limit can be offset by margins available in the inputs/assumptions made in the analysis of record.
- A dual unit shutdown should not be required due to exceeding UHS temperature for short periods of time.
- UHS margin evaluation has been previously approved for Braidwood to justify continued operation for short-term UHS temperature above the TS SR limit.