Watts Bar Nuclear Plant (WBN)

Pre-Submittal Meeting for License Amendment Request
Main Control Room Chiller Completion Time Extension

May 5, 2020

Agenda

- Opening Remarks
- Background
- Control Room Emergency Air Temperature Control System (CREATCS) Design
- CREATCS Modification
- TS 3.7.11, Required Action A.1
- Main Control Room (MCR) Cooling
- Temporary Chilled Water Equipment
- TS 3.7.11, Required Action E.1
- Summary of Compensatory Actions
- Precedent
- Schedule Milestones
- Closing Remarks

Opening Remarks

- The purpose of this meeting is to discuss a proposed license amendment for WBN Units 1 and 2.
- TVA is requesting a license amendment for a one-time change to WBN Units 1 and 2 Technical Specification (TS) 3.7.11, “Control Room Emergency Air Temperature Control System (CREATCS),” Required Actions A.1 and E.1 to support modifications to the CREATCS chillers.
- This presentation will discuss the basis for the proposed TS changes and the modifications that are planned to be made to the CREATCS chillers and proposed compensatory measures.

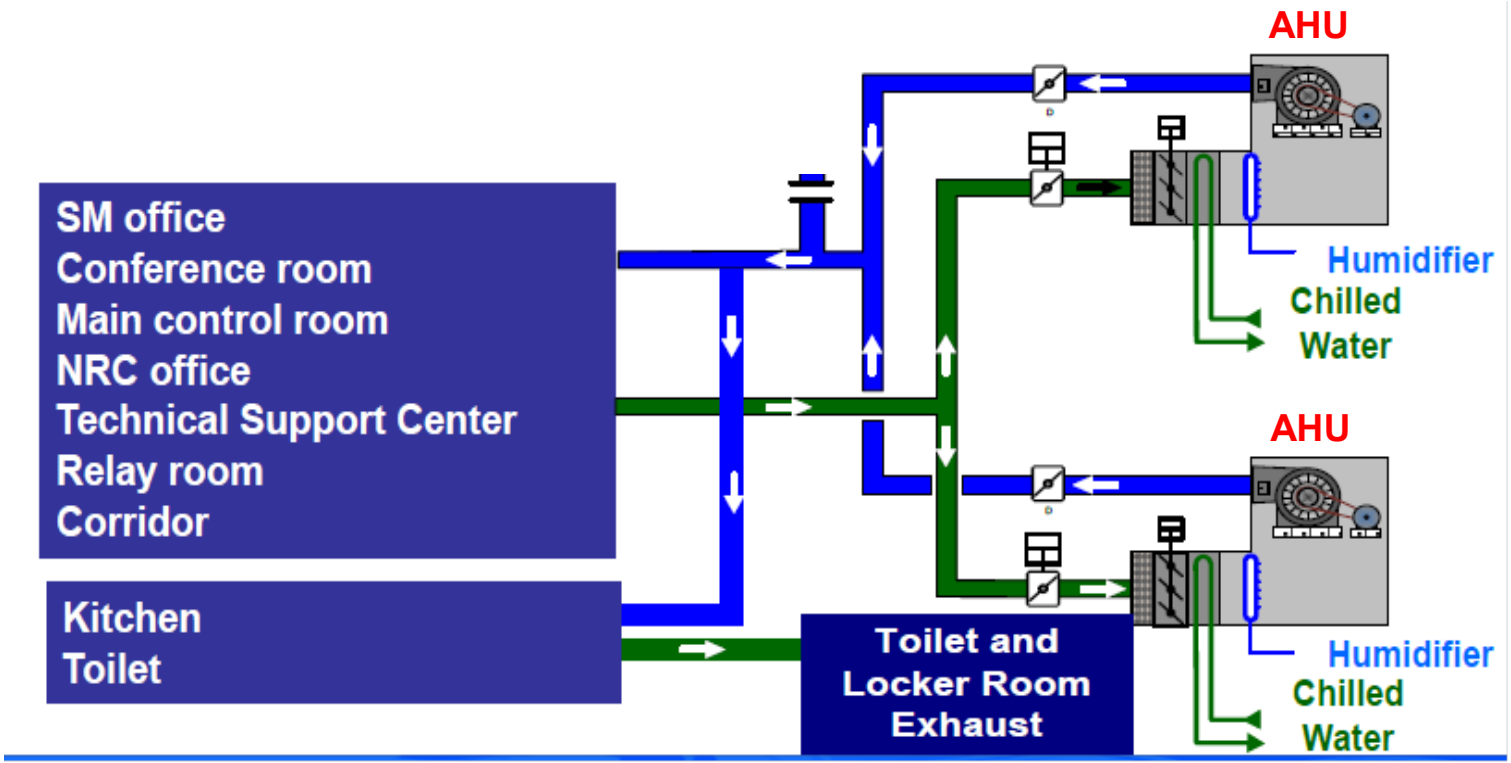
Background

- The CREATCS chiller units are scheduled to be replaced to improve their efficiency.
- The CREATCS provides cooling to the common MCR, therefore, inoperability of the CREATCS affects operation of both Units.
- The Nuclear Regulatory Commission (NRC) previously issued a similar license amendment for WBN Unit 1 on February 8, 2011 (ML110190280) to allow one CREATCS train to be inoperable for up to 60 days while performing the modifications to the CREATCS chillers.
- However, the modifications to the WBN Unit 1 CREATCS chillers were not performed due to issues with the seismic qualification of the replacement chiller units.
  - Documented in NRC Inspection Report 390/2014005 and 390/2014501 (ML15040A425).
- The new chillers will be nuclear grade safety-related which addresses the corrective actions and lessons learned from the previous modification.

CREATCS Design

- The CREATCS provides temperature control for the MCR during normal operation and following isolation of the MCR.
- The CREATCS consists of two independent and redundant trains that provide cooling of recirculated MCR air. Fresh air is also introduced into the MCR through the CREATCS.
- Each train consists of an air-handling unit (AHU), water chiller, chilled water pump, and associated piping, ductwork, instrumentation, and controls to provide for MCR temperature control.
- WBN has a common MCR for Units 1 and 2 located in the Control Building.
- The design basis of the CREATCS is to maintain the MCR temperature for 30 days of continuous occupancy.

CREATCS Design



CREATCS Modification

- The proposed permanent modifications are limited to replacement of each of the CREATCS chiller packages.
- The CREATCS AHUs, chilled water pumps and chilled water piping will not be changed during this modification.
- During CREATCS chiller replacement, the affected CREATCS train will be inoperable.

Train A Chiller Replacement Duration

Activity	Duration (hours)
Shut down, clear equipment and drain the CREATCS chiller train under replacement	12
Connect temporary chilled water system to MCR AHU for the CREATCS chiller train under replacement	20*
Perform testing on temporary chilled water system and place in service	11*
Remove pipe supports, evacuate chiller, disconnect electrical equipment and remove piping and valves for the CREATCS chiller train under replacement	96
Remove old CREATCS chiller unit	180
Remove old SDBR chiller unit	170
Install and assemble new SDBR chiller unit	110
Install and assemble new CREATCS chiller unit	178
Reinstall piping, valves and electrical equipment for new CREATCS chiller unit	240
Reinstall supports for new CREATCS chiller unit	240**
Leak test, charge, pre-operational inspection	132
Remove temporary chilled water system/ restore MCR AHU for the CREATCS chiller train	31*
Perform PMT on MCR HVAC system and declare CREATCS equipment operable	218
Total time for Train A chiller replacement	1336 Hours or 55.7 days

*Activity performed in parallel with chiller replacement activities
** Activity performed in parallel with piping re-installation activities

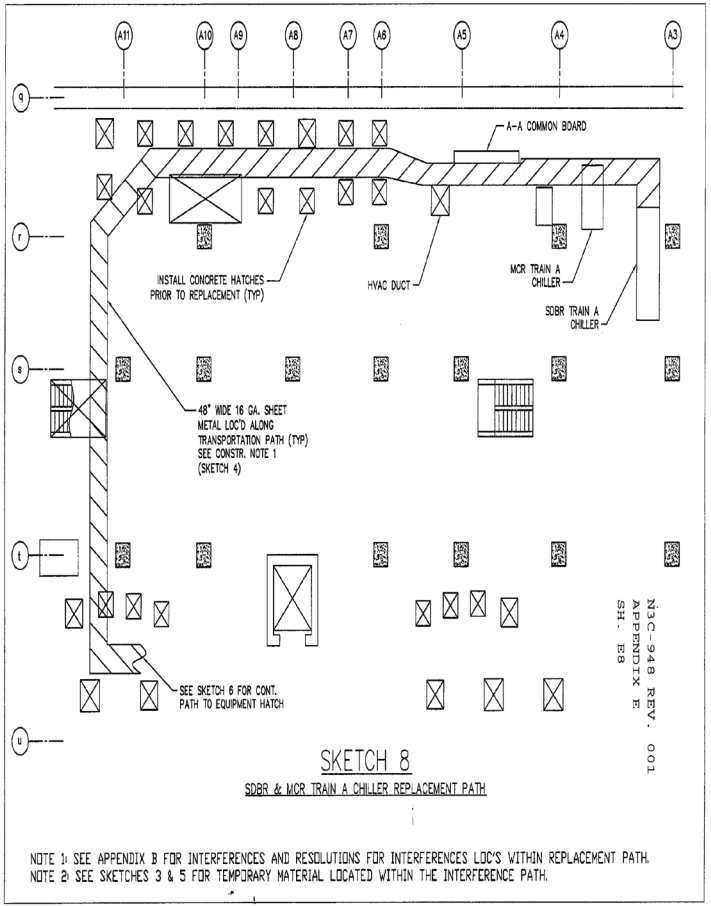
Train B Chiller Replacement Duration

Activity	Duration (hours)
Shut down, clear equipment and drain the CREATCS chiller train under replacement	12
Connect temporary chilled water system to MCR AHU for the CREATCS chiller train under replacement	20*
Perform testing on temporary chilled water system and place in service	11*
Remove pipe supports, evacuate chiller, disconnect electrical equipment and remove piping and valves for the CREATCS chiller train under replacement	72
Remove old CREATCS chiller unit	142
Install and assemble new CREATCS chiller unit	178
Reinstall piping, valves and electrical equipment for new CREATCS chiller unit	168
Reinstall supports for new CREATCS chiller unit	168**
Leak test, charge, pre-operational inspection	132
Remove temporary chilled water system/ restore MCR AHU for the CREATCS chiller train	31*
Perform PMT on MCR HVAC system and declare CREATCS equipment operable	218
Total time for Train B chiller replacement	916 hours or 38.2 Days

*Activity performed in parallel with chiller replacement activities

** Activity performed in parallel with piping re-installation activities

Figure of Train A CREATCS Orientation



TS 3.7.11, Required Action A.1

- TS 3.7.11, Required Action A.1 provides a 30 day Completion Time to restore a CREATCS train to operable status if one train has been declared inoperable.
- To accomplish these chiller replacements, TVA proposes that the TS 3.7.11 Required Action A.1 Completion Time for restoration of one inoperable CREATCS train be extended from 30 days to 60 days.

Proposed Technical Specification Change

Units 1 and 2 – TS 3.7.11 Footnote for Action A.1

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CREATCS train inoperable.	A.1 Restore CREATCS train to OPERABLE status.	30 days *

* An allowance is permitted for the CREATCS train to be inoperable for up to 60 days. This TS provision is only authorized for one entry per train during modification activities planned for the upgrade of the main control room chillers beginning no earlier than May 1, 2021 and ending no later than October 1, 2022, provided compensatory measures are implemented as described in TVA letter CNL-20-012, dated May xx, 2020.

MCR Cooling

- During CREATCS chiller replacement, the affected CREATCS train is inoperable. However, train components remain functional with the exception of the chilled water pump and the chiller unit.
- To provide defense in depth for cooling the MCR, a temporary chiller unit will be installed and connected to the functional CREATCS AHU.
- The temporary chiller unit will operate during the modification to maintain the MCR temperature below limits.
- If the temporary chiller unit fails, the Operable CREATCS train will automatically start on high AHU temperature, or may be manually started to maintain the MCR temperature.

MCR Cooling

- The Operable CREATCS train (in standby) will automatically start after a 30-second delay for the following occurrences:

- (1) high air inlet temperature to the operating AHU,
- (2) low discharge airflow from the operating AHU, or
- (3) low differential pressure across the operating chilled water pump.

- Failure of the operating train for any of these cases is alarmed in the MCR.
- During the CREATCS chiller replacement modification, the low differential pressure start signal from the inoperable CREATCS train will be defeated to allow the temporary chiller system to provide the chilled water to that train. The chilled water pump is out of service during the chiller replacement.

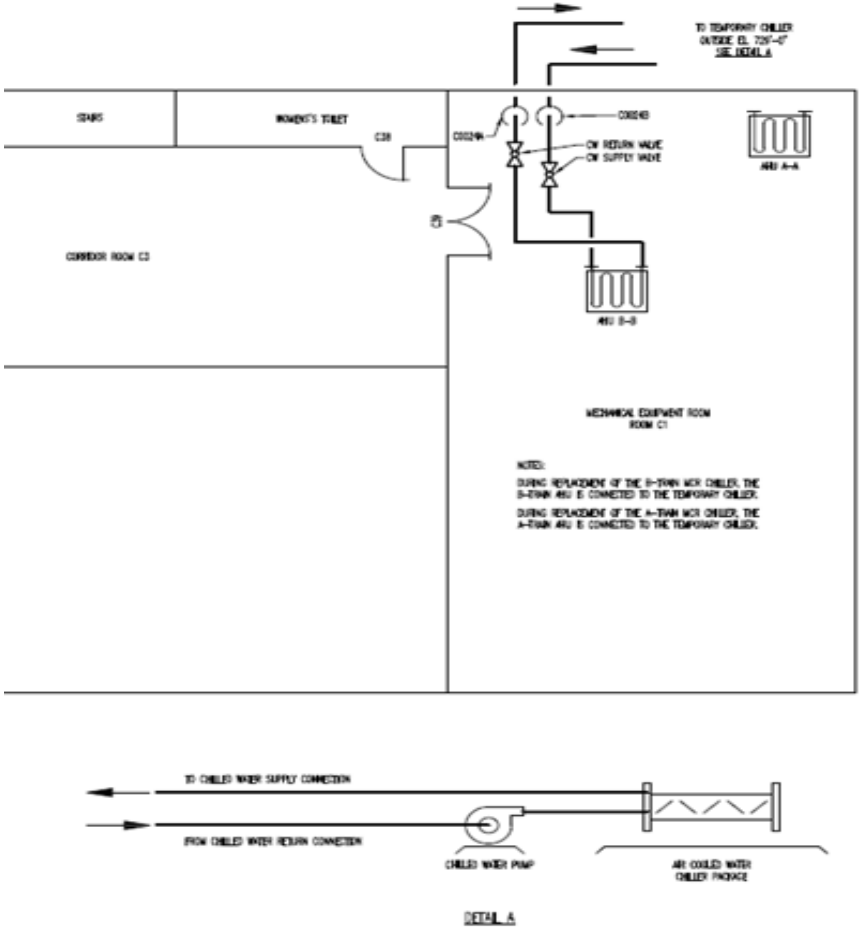
MCR Cooling

- The remaining two start signals will continue to function as designed, providing a diverse means to automatically start the standby Operable CREATCS train. This adequately supports the design function to ensure that a suitable environment is maintained for personnel and equipment in the MCR.
- In addition to the automatic start signals, the temperature in the MCR is monitored every 12 hours per the Technical Requirements Manual Section 3.7.5, “Area Temperature Monitoring.”

Temporary Chilled Water Equipment

- A temporary non-safety related chiller system will be installed and used to support MCR cooling during the CREATCS chiller replacements.
  - This temporary system is capable of providing adequate cooling to maintain the MCR within its normal temperature band.
- The temporary chiller system is robust and reliable as demonstrated by its operation during other maintenance activities.
- The major components of the temporary chiller system include:
  - Air cooled chilled water package
  - Chilled water pump
  - Power supply, cables, and connections
  - Chilled water supply and return hoses
  - Demineralized water source
  - Engineered penetrations with isolation valves
  - Backup diesel generator (DG) with fuel tank

Temporary Chilled Water Equipment



Temporary Chilled Water Equipment

- The temporary chiller system will use a 150-ton (minimum) capacity portable air-cooled chiller, a 500 gallons per minute (gpm) chilled water pump or pumps, temporary chilled water supply and return hoses, temporary penetration configurations and associated isolation valves, temporary chilled water connections to the appropriate AHU, and a 320kW DG.
- TVA performed a calculation that considered operational heat loads, the nominal rating of the temporary chiller unit, and nominal temporary chilled water pump ratings.
  - The calculation determined that MCR temperatures would remain below 80°F.
- These components are on stand-alone skid mounted packages and will be located in the yard west of the Auxiliary Building and in the Control Building
- Supply and return hoses will be used for routing the chilled water from the temporary chilled water package to the AHUs in the Control Building.

Temporary Chilled Water Equipment

- Existing sleeves located on Elevation 755.0 which are part of the MCR boundary will be used for routing the chilled water supply and return hoses to the appropriate MCR AHU located in the Mechanical Equipment Room.
- Two manual isolation valves, one for each penetration through the MCR boundary will be provided for isolation purposes.
  - The valves at the penetrations are qualified for seismic retention to maintain the integrity of the MCR boundary.
- The temporary hoses, pipe, and fittings are qualified for adequate pressure to protect against rupture and pipe whip.
- A combustible loading evaluation has been performed to ensure the materials associated with this temporary modification do not substantially increase fire risks within the Control Building.
- Spill containment will be provided beneath the chiller skid.

Temporary Chilled Water Equipment

- The temporary non safety related chiller system and chilled water pump will be powered from non-safety related 480V AC sources located within the station area.
- The temporary chilled water system has a temporary 320 kW DG dedicated to it so that it can operate independently of site power.
- The temporary chiller is not proposed as a safety related substitute for the permanent CREATCS chillers. Therefore, for this one-time TS extension request, the installation of the temporary chiller system, without the application of all safety related design criteria associated with weather and missile protection, is appropriate.

Control Room Habitability

- The CREATCS together with the Main Control Room Habitability System (MCRHS) provides for the safe uninterrupted occupancy of the MCR Habitability Zone (MCRHZ) during an accident and subsequent recovery period
- The MCRHZ is unaffected by the temporary chilled water system.
  - No changes to the ductwork, AHU characteristics, or the various system air flows serving the MCRHZ.
  - No changes to the emergency air cleaning system and no impact to post accident dose analysis.
  - The temporary chiller system and associated equipment will have no interface with the MCRHZ isolation, and therefore, will not impact the ability to isolate the MCRHZ or the ability of the emergency air cleanup system to function as designed.
- Penetrations used for the temporary chiller supply and return hoses are limited in size to remain below the MCR boundary unfiltered inleakage criteria.

TS 3.7.11, Required Action E.1

- TS 3.7.11, Required Action E.1 addresses a condition with two trains of CREATCS inoperable.
  - It requires immediate entry into Limiting Condition for Operation (LCO) 3.0.3, with subsequent Unit shutdown.
  - Because WBN has a common MCR for both Units, this would require a dual Unit shutdown.
- During CREATCS chiller replacement, the affected CREATCS train will be inoperable.
- If the other CREATCS train should be declared inoperable due to a failure or during post modification testing, LCO 3.0.3 is required to be entered immediately.
- A four-day delay is requested prior to entering LCO 3.0.3 based on corrective maintenance repair times.
- MCR temperature will be monitored hourly to ensure it remains below 90°F.

Proposed Technical Specification Change

Units 1 and 2 – TS 3.7.11 Footnote for Action E.1

E.	Two CREATCS trains inoperable in MODE 1, 2, 3, or 4.	E.1	Enter LCO 3.0.3.	Immediately **

** An allowance to monitor the main control room temperature every hour and verify the main control room temperature is less than or equal to 90 degrees Fahrenheit (°F) is permitted for up to four days in lieu of the immediate entry into LCO 3.0.3. If the main control room temperature exceeds 90°F, or the duration without a train of CREATCS being OPERABLE exceeds four days, the immediate entry into LCO 3.0.3 will be required. This provision is only applicable during modification activities planned for the upgrade of the main control room chillers beginning no earlier than May 1, 2021 and ending no later than October 1, 2022.

Corrective Maintenance Time for CREATCS

Date	Corrective Maintenance Issue	Unavailability Time (Hours:Mins)	Unavailability Time (Days)
11/8/19	MCR Chiller A TCV failed	51:19	2.14
11/5/19	MCR Chiller A TCV failed	49:11	2.05
3/31/19	MCR Chiller B Air Handling Unit (AHU) motor failure	70:45	2.95
3/28/19	MCR Chiller B AHU motor failure	74:10	3.09
7/9/18	MCR Chiller B not cooling	88:00	3.67
4/12/17	MCR Chiller A oil temperature issue	77:20	3.22
3/8/16	MCR Chiller A Oil Cooler Temperature Control Valve (TCV) failure	64:43	2.70
10/8/15	MCR Chiller B Essential Raw Cooling Water (ERCW) leak on oil return line (rework from repair made during week)	25:29	1.06
9/30/15	MCR Chiller B ERCW copper pipe rupture	64:52	2.70
3/1/15	MCR Chiller A ERCW TCV failed	31:00	1.29

TS 3.7.11, Required Action E.1

- The proposed footnote to TS 3.7.11, Condition E, is based on verifying that the MCR temperature is less than or equal to 90°F.
- The temperature limit for MCR equipment operability is 104°F.
- The 90°F temperature limit provides margin between the normal MCR operating temperature of 75°F and a limit that ensures that the equipment operability limit of 104°F is not exceeded.

TS 3.7.11, Required Action E.1

- The proposed footnote for TS 3.7.11, Required Action E.1 requires that operators monitor the MCR temperature every hour and verify the MCR temperature is less than or equal to 90°F.
- To support the one-hour frequency for temperature monitoring TVA evaluated the effect of a loss of cooling on the MCR temperature by performing an analysis of the heatup of the MCR and surrounding areas.
- Two cases were evaluated
  - Normal operating heat loads, summertime maximum outdoor temperatures, one AHU operating, no chillers in operation
  - LOCA heat loads, summertime maximum outdoor temperatures, no AHUs running, no chillers in operation
- The calculation demonstrates that the temperature increase from 75°F (normal MCR operating temperature) to 104°F takes approximately 5.6 hours for the normal operating heat load case and 4.6 hours for the LOCA heat load case.

TS 3.7.11, Required Action E.1

- The one-hour frequency for temperature monitoring is adequate based on the heat-up calculations for the MCR and the indications available in the MCR.
- With hourly temperature monitoring, a degraded condition would be identified before equipment temperature limits were reached and Unit shutdown activities would be initiated.
- Additionally, with operators continually stationed in the MCR, temperature increases of this magnitude would most likely be identified before the hourly monitoring requirement.

TS 3.7.11, Required Action E.1

- Maintaining MCR temperatures at or below 104°F will ensure that the safety-related functions are operable.
- Since this proposed change maintains the CREATCS function for a limited period of time and supports plant safety functions, there is no adverse impact to nuclear safety.
- The proposed change will allow both Units to continue power operation and not be subjected to an unnecessary shutdown when sufficient cooling is available to maintain an acceptable MCR environment.

TS 3.7.11, Required Action E.1

- The proposed delayed entry into LCO 3.0.3 would be used if the operable CREATCS train became inoperable unexpectedly. It is also proposed that the delayed entry into LCO 3.0.3 be used to support post modification testing.
- Delayed entry into LCO 3.0.3 is needed to allow stabilization of the water and air flow from the modified CREATCS train during post modification testing. This impact is due to the automatic start signals from the modified train requiring the operable train to start inappropriately and repeatedly.
  - For example, during testing of the modified train, there may be cooling water flow and air flow anomalies that would signal the operable train to start unnecessarily
- This type of entry into TS 3.7.11, Condition E would only be used in direct support of post modification testing and only when the potential for anomalous water and/or air flow in the modified CREATCS train is possible.

Summary of Compensatory Actions

- A temporary, non-safety related chiller system with a temporary DG to provide power to the temporary chiller system will be installed and operated as described.
- Instructions for operation of the temporary cooling equipment will be provided.
- During replacement of the CREATCS chillers, TVA will employ a graded approach to defense-in-depth and protected equipment strategies based on the operating status of the affected unit. The risk of the activity will be assessed and managed, including the use of physical barriers as needed. Additionally, TVA procedures preclude work on or near protected equipment and limit access to the area to emergency situations and non-intrusive monitoring of running equipment per operator rounds.
- During replacement of the CREATCS chillers, no elective maintenance will be performed on TS related support equipment for the Operable CREATCS chiller except for any required TS Surveillance Requirements.

Precedent

- NRC license amendment for WBN Unit 1 dated February 8, 2011 (ML110190280)
  - NRC approved a 60-day extension to the TS 3.7.11, Required Action A.1 Completion Time
- NRC license amendment for Sequoyah Nuclear Plant, Units 1 and 2, dated May 21, 2004 (ML041460534)
  - NRC approved a 7-day extension to the 3.7.15.b Completion Time
- NRC license amendment for Surry Power Station, Unit Nos. 1 and 2 dated January 23, 2008 (ML0734800287)
  - NRC approved a 14 and 45-day extension to the Completion Time for one train of switchgear room air conditioning
- NRC license amendment for Seabrook Station, Unit No. 1 dated September 17, 1999 (ML011920184)
  - NRC approved a 60-day extension to the Completion Time for one train of control room air conditioning

Schedule Milestones

- May 5, 2020 – LAR Pre-Submittal Meeting with NRC
- May 2020 – LAR Submittal – Request NRC approval within 12 months of submittal with 30-day implementation
- June 2020 – Telecon or meeting to discuss any NRC questions
- May 2021 – NRC Approval of LAR (Requested)

Closing Remarks


TVA