



BFN Proposed Chilled-Water Cross-tie Modification
License Amendment Request
Pre-Submittal Meeting with NRC

February 15, 2018

Agenda

- Introductions / Opening Remarks
- Meeting Purpose
- Background / Operational Experience
- Building and Current System Configurations
 - Unit 1/2 and Unit 3
- Description of Modification
- Cross-tie Modification – Conceptual Design
- Design Impact
- LAR Description / Justification
- Proposed Schedule
- Acronym List
- Questions/Comments

TVA Participants

- Erik Meisner, BFN Engineering Director
- Todd Stafford, BFN Mechanical Design Manager
- Ron Hand, BFN Mechanical Design Engineer
- Ed Schrull, TVA Fleet Licensing Manager
- Gordon Williams, TVA Fleet Licensing Program Manager

Meeting Purpose

- Describe plant configuration and prescribed conditions that have resulted in the need for a Design Modification and License Amendment Request (LAR)
- Outline key attributes of a proposed LAR to utilize the Unit 3 Control Bay (CB) Chiller as an alternate chilled-water source for the Unit 1/2 Electric Board Room (EBR) Air Handling Units (AHUs) to support system operability
- Obtain feedback on proposed changes and provide clarification to NRC questions

Background - Unit 1 and 2 Control Bay HVAC

- Pre-2000 Design Change
 - The Unit 1/2 CB Chillers were Emergency Equipment Cooling Water (EECW)-cooled and served the following area AHUs
 - > U1/2 Main Control Room
 - > Safety Related (SR) Equipment Rooms on Elevation 593
 - > Common Switchyard Relay Room
 - EBRs for each Unit were cooled by two 100% capacity Air Conditioning (AC) Units

Background - Unit 1 and 2 Control Bay HVAC

- Post-2000 Design Change
 - Abandoned the EECW-Cooled CB Chillers
 - Installed two roof-mounted Air-Cooled chillers.
 - Converted EBR AC Units to AHUs, and served by the CB Chiller

Because of this design change, the Loss of Two CB Chillers immediately results in the inoperability of both Unit 1 and 2 EBR AC Systems and associated supported systems based on the Technical Specification (TS) definition of OPERABLE-OPERABILITY.

Background - Unit 1 and 2 Control Bay HVAC

- If a Unit 1 and/or Unit 2 EBR AC System is declared inoperable, then the Electrical Equipment in the affected EBR(s) must also be declared inoperable
 - This would result in entry into TS LCO 3.8.7 Distribution Systems – Operating, Conditions F (Unit 1) and G (Units 2 and 3)
 - These LCO Conditions require, for each Unit, with one or more required AC or DC boards inoperable, that the affected SGTS or CREV subsystem be declared inoperable
 - In addition, BFN Units 1 and 2, would enter TS LCO 3.8.7, Conditions H (Unit 1) and I (Unit 2)
 - These LCO Conditions require, with two or more electrical power distribution subsystems inoperable that result in a loss of function, that the unit enter TS LCO 3.0.3 immediately

Background - Unit 1 and 2 Control Bay HVAC

- In addition...
 - With SBT A and B inoperable, BFN Units 1, 2, and 3, would enter TS LCO 3.6.4.3, SBT System, Condition D
 - This LCO Condition requires, with two or three SBT subsystems inoperable in MODE 1, 2, or 3, that the unit enter TS LCO 3.0.3 immediately
- As a result, BFN Units 1, 2, and 3, would enter TS LCO 3.0.3 with required action within one hour to initiate action to place Unit 1, 2, and 3 in MODE 2 within 10 hours, in MODE 3 in 13 Hours, and in MODE 4 in 37 hours

BFN Operational Experience

- On 7/14/15 and 9/9/17, the loss of both CB chillers supporting the Unit 1 and 2 Control Room AC subsystem and the Unit 1 and 2 EBR AC subsystems resulted in the entry into TS 3.0.3
[LERs 50-259/2015-003-00 and 50-259/2017-004-00]
- For the event occurring on 7/14/15, TS 3.0.3 was exited within seven hours
- For the event occurring on 9/9/17, an NOED (17-2-01) was granted



Building Configuration

Control Building HVAC

The Control Building Heating, Ventilating, and AC Systems serve the three floors in the control bay and the six shutdown EBRs in the Reactor Building immediately adjacent to, and normally entered from, the control bay. There are several separate subsystems serving these areas.

Current System Configuration U1 & U2

Unit 1/2 CB Chilled Water System circulates chilled water in a closed loop configuration

- Two 100% capacity chilled water pumps
- Two 100% capacity water chiller units, roof-mounted & air-cooled

Unit 1/2 CB Bay Chilled Water System Serves Nine Area AHUs:

- Two 100% capacity - Unit 1 EBRs
- Two 100% capacity - Unit 2 EBRs
- Two 100% capacity - Unit 1 and 2 Control Room
- Two 100% capacity - Unit 1 and 2 SR Equipment Rooms on EL 593
- One 100% capacity – Common Switchyard Relay Room EL 617

Current System Configuration U3

- The Unit 3 CB Chilled Water System circulates chilled water in a closed loop configuration.
 - Two 100% capacity chilled water pumps
 - Two 100% capacity water chiller units, water-cooled condenser (EECW)
- The Unit 3 Chilled Water System serves five area AHUs
 - Two 100% capacity units - SR Equipment Rooms on EL 593
 - Two 100% capacity units - Unit 3 control room & office spaces, EL 617
 - One 100% capacity unit - Common Switchyard Relay Room, EL 617
- The 480v EBR and 4kv Shutdown Board Room cooling is independent from the Unit 3 CB Chilled Water System

Description of Modification

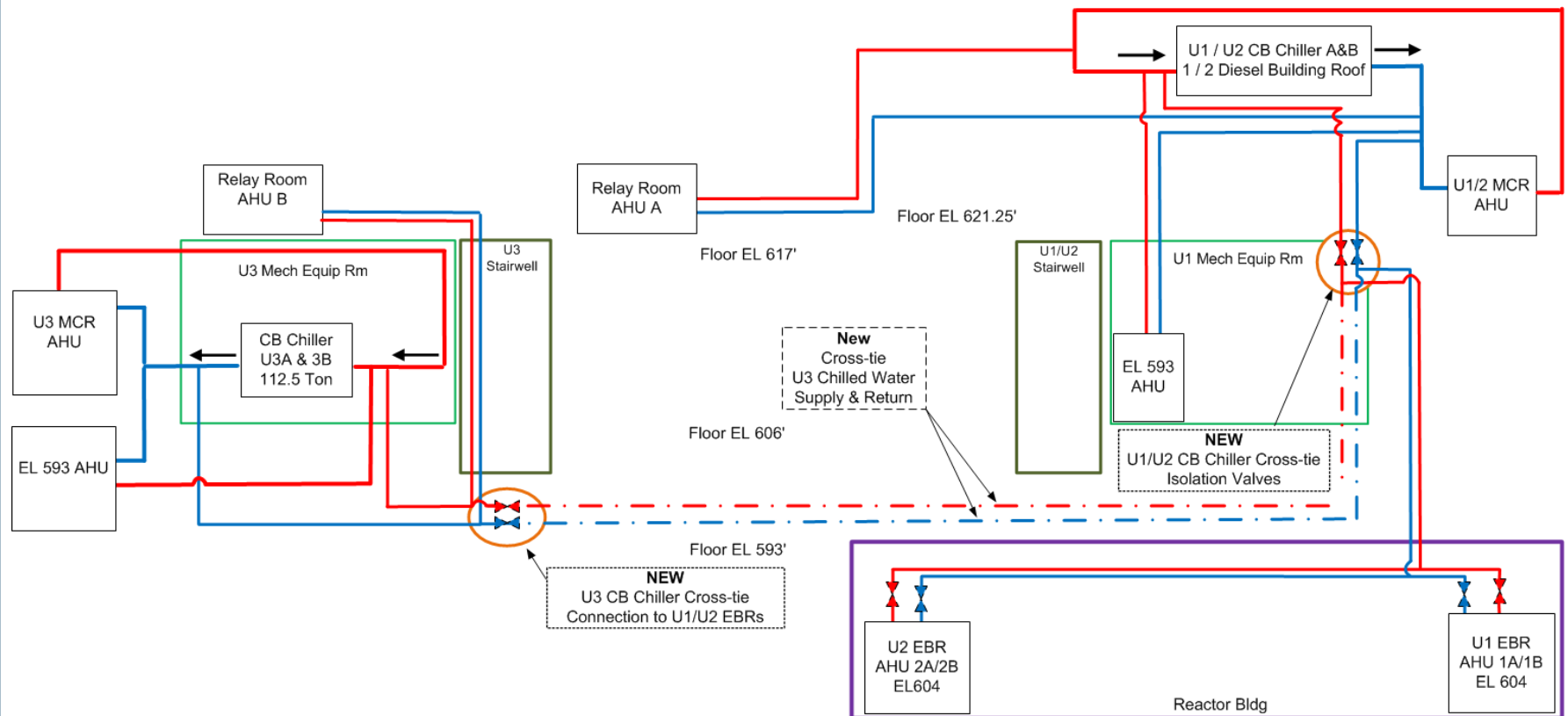
Chilled-Water Cross-tie:

Add piping and valves connecting U3 chilled water directly to the existing piping for the Unit 1 and 2 EBR AHUs

- Utilization of cross-tie will requires isolation from Unit 1/2 CB Chiller and alignment to the operating Unit 3 CB Chiller
- Alignment will involve manually manipulating four 2" valves to align the Unit 3 CB Chiller
- Valves will be readily accessible in the control building
 - > U1/2 Isolation Valves, EL 606 Equipment Room
 - > U3 Chilled-Water Supply Valves, EL 593 Hallway

Intent of modification is to preclude entry into LCO 3.0.3 by crediting Unit 3 CB Chilled Water when two CB Chillers are inoperable

Cross-tie Modification – Conceptual design



Design Impact

- Additional Design Basis Heat Load imposed on the Unit 3 CB Chillers by the Unit 1 and 2 EBRs reduces design margin
 - Design Capacity of Unit 3 CB Chiller is 112.5 ton
 - Current Design Basis Load on Unit 3 CB Chiller is 57 ton
 - EBR Design Basis Heat Loads
 - > Unit 1 = 20.5 ton
 - > Unit 2 = 16.5 ton

Design Impact

- In accordance with Surveillance Requirement SR 3.7.4.1
 - Revise 3-SR-3.7.4.1 (Control Room AC System Performance) to include additional Unit 1 and 2 EBR heat loads imposed via Cross-tie connection
 - Surveillance Instruction ensures the Unit 3 Control Room AC System has the capability to remove the assumed heat load by verifying proper chilled water temperatures and chilled water flows

Design Impact

- Proposed design change does not require changes to TS 3.7.4 “Control Room AC System”
 - Cross-tie would be desired for TS 3.7.4 Condition B (Two Unit 1 and 2 Control Room AC subsystems inoperable).
 - Utilization of Cross-tie to maintain EBR OPERABILITY does not preclude TS 3.7.4 Required Action B.3 (7-Day LCO Action)
 - Utilization of Cross-tie would be limited to 7 days as dictated by TS 3.7.4 Required Action B.3

LAR Description

- NRC prior approval of a proposed modification to install a cross-tie connecting the Unit 3 Chilled Water System to the Unit 1 and 2 EBR AHUs
- NRC approval of the use of the proposed cross-tie to support operability of the BFN Unit 1 and 2 EBR equipment
- Potential need for a one-time only TS change for EBR Support Systems to allow completion time for connection of Cross-tie to AHU piping

LAR Description

- Revision to FSAR Section 10.12 “HVAC Systems,” Figure 10.12-9, Figure 10.12-10 (add), and Appendix F, “Unit Sharing and Interactions,” identifying the U3 CB Chiller as a shared chilled-water source for Unit 1 and 2 EBR AHUs that is achieved via cross-tie connection

LAR Justification

- Utilizing Unit 3 CB Chiller as a shared system to support Unit 1 and 2 EBR operability is in compliance with General Design Criteria (GDC), Criterion 5 - Sharing of Systems, because safety is not impaired by the proposed activity.
- However, because the FSAR does not explicitly identify the Unit 3 CB Chiller as a shared system in the proposed capacity, TVA is conservatively requesting NRC prior approval

Proposed Schedule

Activity	Milestone Date
NRC Pre-application Meeting	02/15/2018
LAR Submittal	04/27/2018
Start Design Change Package	04/27/2018
NRC Acceptance of LAR	05/25/2018
Design Change Package Complete	02/28/2019
NRC Issues Safety Evaluation	05/30/2019
Complete Design Change Implementation	06/30/2019

Acronym List

AC = Air Conditioning

AHU = Air Handling Unit

CB = Control Bay

CREV = Control Room

Emergency Ventilation

EBR = Electric Board Room

EECW = Emergency Equipment
Cooling Water

kv = kilovolt

LAR = License Amendment Request

LCO= Limiting Condition for

Operation

RAI = Request for Additional
Information

SBGT = Standby Gas Treatment

SE = Safety Evaluation

SR = Safety Related

TS = Technical Specification

TVA = Tennessee Valley Authority

v = Volt

