



Brunswick/NRC Pre-submittal Meeting: LAR to Adopt TSTF-505, Rev. 2 (Risk-Informed Completion Times)

February 17, 2021



Duke Energy Attendees

Art Zaremba (Manager, Nuclear Fleet Licensing)

Bob Rishel (Director, Probabilistic Risk Assessment)

Heather Szews (Manager, Probabilistic Risk Assessment)

Jordan Vaughan (Lead Nuclear Engineer, Nuclear Fleet Licensing)

Art Mironenko (Senior Nuclear Engineer, Probabilistic Risk Assessment)

Alan Schultz (Nuclear Shift Manager, Operations)

- Introduction (Desired Meeting Outcomes)
- PRA Models and Real-Time Risk Model Overview
- License Amendment Request Overview
- Recent OE (TSTF-505 LARs and associated audits)
- Implementation
- Timeline for LAR Submittal/Closing Remarks

Overview of PRA Portion of BSEP TSTF-505 LAR

- Consistent with TSTF-505 Rev. 2 Template
 - No Loss of Function TS Actions are proposed
- PRA models updated/upgraded and peer-reviewed
- F&O Closure independently validated
- Total CDF/LERF meet RG 1.174 criteria
- Seismic: Penalty applied for CDF and LERF
- High Winds: LOOPs included in IE PRA (Other High Wind effects screened)
- External Flooding: Hazard screened per the standard
- Unit-specific PRAs will be used for application
 - Sample calculations presented in LAR are from Unit 1, consistent with other applications

Internal Events/ Internal Flood PRA

- 2010 - BSEP IE and IF PRA model was subject to a full-scope peer review against RG 1.200 Rev. 2 IAW guidance in NEI-05-04.
- 2016 - Internal Flooding PRA, a focused scope industry peer review was conducted against RG 1.200 Rev. 2.
- Closed findings were reviewed and closed in August 2017, December 2019 and May 2020 for the IE and IF PRA models using the process documented in Appendix X to NEI 05-04, NEI 07-12 and NEI 12-13, “Close-out of Facts and Observations” (F&Os) as accepted by NRC (ML17079A427).
- There are zero open findings and all applicable supporting requirements are met at capability category II.

- 2011 - BSEP Fire PRA was subject to full-scope peer review against RG 1.200 Rev. 2 IAW guidance in NEI-07-12.
- 2015 – Fire PRA, a focused scope industry peer review was conducted against RG 1.200 Rev. 2.
- Closed findings were reviewed and closed in July 2017 and August 2018 for the Fire PRA models using the process documented in Appendix X to NEI 05-04, NEI 07-12 and NEI 12-13, “Close-out of Facts and Observations” (F&Os) as accepted by NRC (ML17079A427).
- There are zero open findings and all applicable supporting requirements are met at capability category II.

F&O Closure Review

- Formal process by independent review team
 - Assessed disposition of Findings for Internal Events, Internal Flooding, and Fire PRAs
 - Addressed in detail in the LAR assessment Technical Adequacy section
 - The process evaluated whether the disposition of each finding constitutes an update or upgrade

Seismic

- Seismic penalty will be applied to all RICTs

High Winds

- LOOPs included in IE PRA
- Hurricane, Straight-line winds and Tornado high wind hazard screened

Other Hazards (continued)

External Flooding

- External Flooding hazard can be screened from calculations in the RICT Program.

Other Hazards

- No other external hazards required to be included in the RICT calculations.

RICT Program Real-Time Risk Model

- Real-Time Risk Model as currently used for existing Maintenance Rule a(4) Configuration Risk Management Program
 - Uses PHOENIX Risk Analysis Software
 - Incorporates RICT/RMAT calculation features

License Amendment Request

- Based on TSTF-505, Revision 2 and NEI 06-09
- 20 different Technical Specifications (TS) impacted by proposed change for both Units 1 and 2
 - Various instrumentation TS are proposed to be in scope of RICT Program
- Modes 1 and 2 only
- New TS Section 5 Program for RICT Program
- Variances from TSTF-505, Revision 2
 - Subtle differences in Condition/Required Action wording
 - TSTF-505 Conditions/LCOs exist that are not in the BSEP TS
 - Re-typed/clean TS pages not included
 - RICTs proposed for some plant-specific TS Actions not in TSTF-505, Rev. 2

TS 3.5.1, ECCS - Operating

LCO:	Each ECCS injection/spray subsystem and the Automatic Depressurization System (ADS) function of six safety/relief valves shall be OPERABLE.
Condition B:	One [low pressure coolant injection] LPCI pump inoperable; and one core spray (CS) subsystem inoperable.
Condition H:	One required ADS valve inoperable; and [high pressure coolant injection] HPCI System inoperable.

- Conditions B and H are plant-specific and are not in NUREG-1433/TSTF-505, Rev. 2
- Condition B applies to one CS subsystem inoperable concurrent with one LPCI pump
 - 72 hours to restore the CS subsystem or LPCI pump to operable status
 - remaining OPERABLE low pressure ECCS subsystems and the remaining pump in the inoperable LPCI subsystem provide adequate core cooling during a LOCA
- Condition H applies to the HPCI System inoperable concurrent with one required ADS valve
 - 72 hours to restore the HPCI System or ADS valve to operable status
 - Remaining ADS valves and low pressure ECCS subsystems perform safety function

TS 3.7.2, Service Water System and Ultimate Heat Sink

LCO:	SW System and UHS shall be OPERABLE.
Condition A:	One required nuclear service water (NSW) pump inoperable due to an inoperable Unit 2 [Unit 1] NSW header.
Condition C:	One required conventional service water (CSW) pump inoperable.
Condition E:	Two required CSW pumps inoperable.
Condition F:	One required NSW pump inoperable; and one required CSW pump inoperable.
Condition G:	One required NSW pump inoperable; and two required CSW pumps inoperable.

- Condition A (opposite unit in Mode 4 or 5) - with a unit in this condition, sufficient cooling water can still be provided to the DGs
- Condition C - Operable CSW pump and NSW pumps are adequate to perform the heat removal function
- Condition E - the OPERABLE NSW pumps are adequate to perform the heat removal function.
- Condition F - OPERABLE SW pumps (both CSW and NSW pumps) are adequate to perform the heat removal function
- Condition G – adequate heat removal capability from remaining SW pumps

TS 3.8.7, Distribution Systems

LCO:	Division I and Division II AC and DC electrical power distribution subsystems shall be OPERABLE.
Condition A:	One AC electrical power distribution subsystem inoperable for planned maintenance due to either inoperable load group E3 bus(es) or inoperable load group E4 bus(es).

- The above LCO and Condition A is for Unit 1; Unit 2 is similar except the inoperable load groups buses are E1 and E2
- In Condition A, and with Unit 2 in MODE 4 or 5, the remaining AC electrical power distribution load groups can support the minimum safety functions necessary to shut down the operating reactor and maintain both reactors in a safe condition, assuming no single failure in the remaining AC electrical power distribution load groups.
- If Unit 2 is in MODE 1, 2 or 3, then the ACTIONS of Unit 2 Specification 3.8.7 requires restoration of the associated AC electrical power distribution subsystem within 8 hours of the inoperability

- Key issues from other TSTF-505 audits, including Harris:
 - Potential loss of function Conditions – none for BSEP
 - Defense-in-depth principles associated with instrumentation TS
 - Reactor Protection System (RPS) Instrumentation - TS 3.3.1.1
 - Feedwater and Main Turbine High Water Level Trip Instrumentation - TS 3.3.2.2
 - Anticipated Transient Without Scram Recirculation Pump Trip (ATWS-RPT) Instrumentation - TS 3.3.4.1
 - Emergency Core Cooling System (ECCS) Instrumentation - TS 3.3.5.1
 - Reactor Core Isolation Cooling (RCIC) System Instrumentation - TS 3.3.5.2
 - Primary Containment Isolation Instrumentation - TS 3.3.6.1
 - Treatment/Credit for FLEX in the PRA Models
- OE from Harris TSTF-505 LAR/RAI Responses and other industry TSTF-505 LAR OE

- Operations owns implementation
- Cross-functional team supporting implementation
- RICT implemented in Modes 1 and 2 only
- Real-Time Risk and PRA Models updated to support the RICT Program
- Procedure changes and training
- Industry OE (Benchmark, Risk-Informed TS Task Force, TSTF)

Procedures and Training

- Existing fleet RICT Program procedures and revised site-specific procedures will address the following:
 - The new BSEP RICT Program (responsibilities, definitions, plant conditions for which the program applies etc.)
 - Calculation of risk management action times (RMAs) and RICTs
 - Development and implementation of RMAs
 - Use of the CRMP software tool (i.e., PHOENIX or the real-time risk model) with the RICT Program
- Three levels of training for the RICT Program is proposed:
 - Level 1 – User Training
 - Level 2 – Management Training
 - Level 3 – Site Awareness Training

Closing Remarks

- Next Steps:
 - Submit LAR by early April 2021
 - Revise site-specific implementing procedures in parallel and subsequent to NRC staff review of LAR; leverage existing fleet procedures that were developed for Harris for the RICT Program
 - Conduct training for RICT Program
 - Ready to implement RICT Program within 180 days of receipt of SE

