



Duke Energy Pre-submittal Meeting
September 4, 2025



Pre-Submittal Meeting

License Amendment Request Utilizing the Risk-Informed Process for
Evaluations (RIPE) to Address Essential Services Chilled Water
System Technical Specification Revision

Shearon Harris Nuclear Power Plant (HNP)

Duke Energy Attendees

Ryan Treadway (Director, Nuclear Fleet Licensing)

Dennis Earp (Nuclear Fleet Licensing)

Heather Szews (Manager, Probabilistic Risk Assessment)

Myung Kang (Probabilistic Risk Assessment)

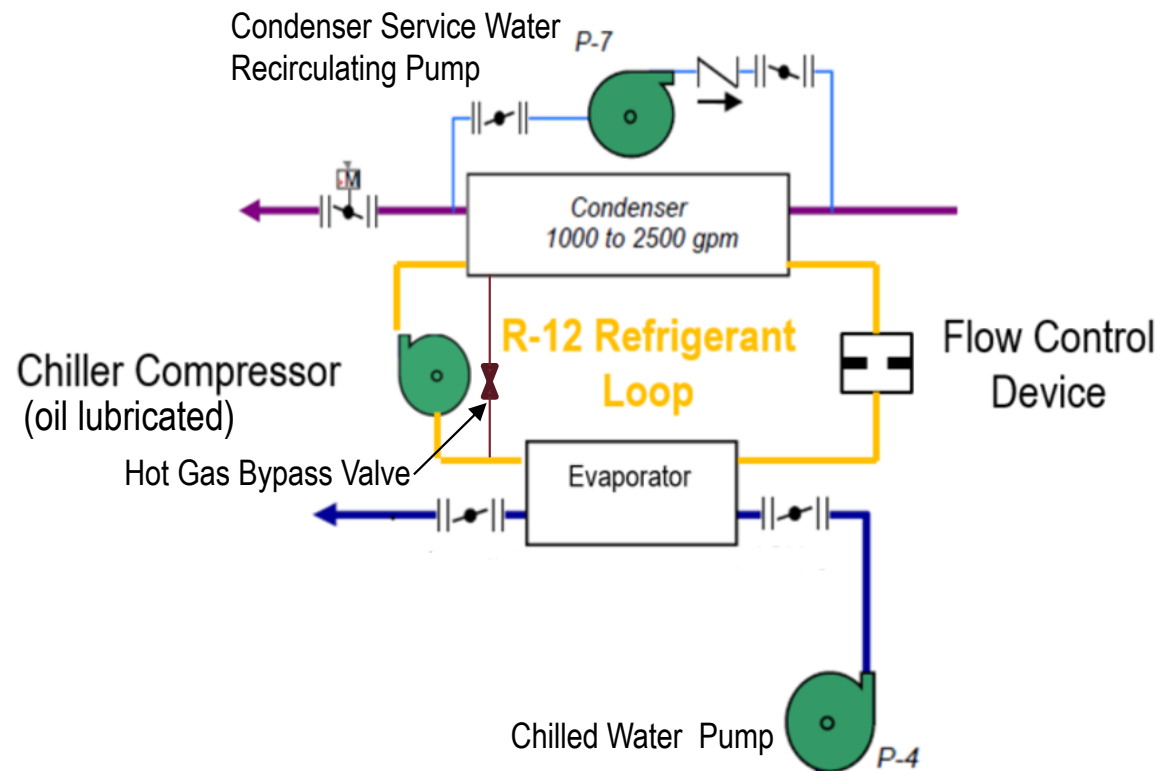
Ryan Pope (Project Manager, HPO Projects)

Agenda

- System Design and Operation
- Reason for Change
- Description of Change
- Application of the RIPE Process
- PRA Analysis
- PRA Results
- Precedent
- Schedule

System Design and Operation

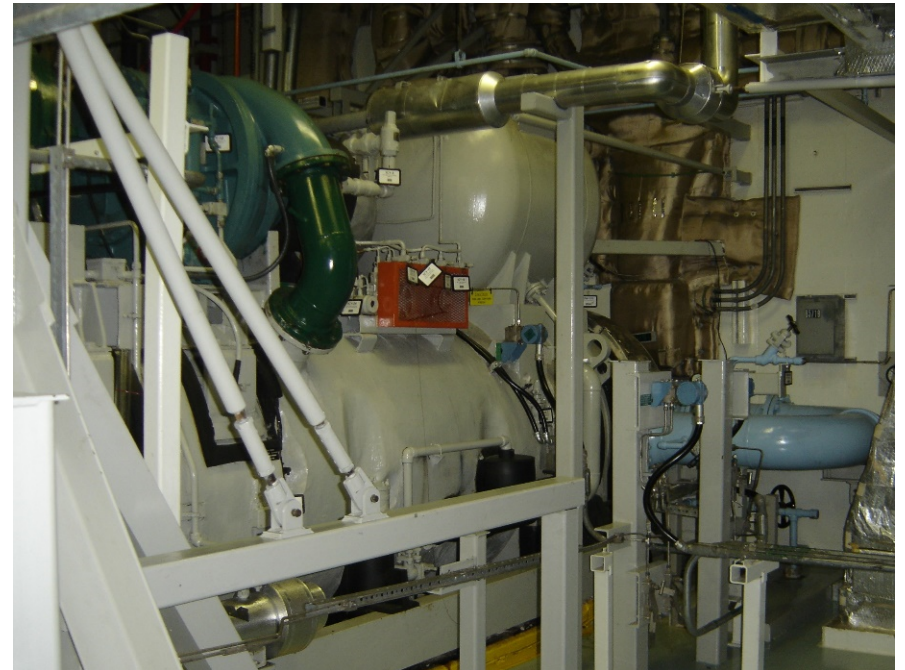
Essential Services Chilled Water System (ESCWS) Chiller Package



System Design and Operation

ESCWS provides chilled water to the cooling coils of air handling units for:

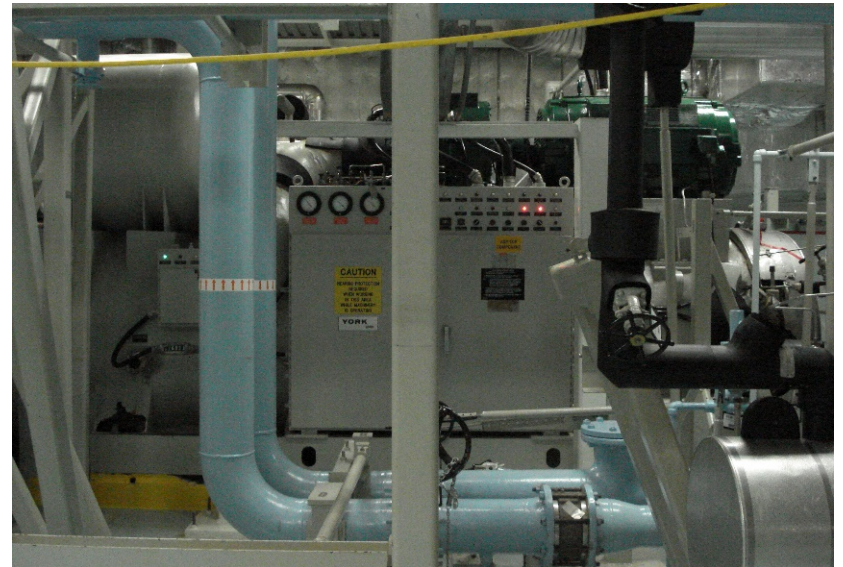
- Control Room Air Conditioning System
- Reactor Auxiliary Building Engineered Safety Feature (ESF) Equipment Cooling System
- Reactor Auxiliary Building Switchgear Rooms Ventilation System



System Design and Operation

ESCWS also provides chilled water to the cooling coils of air handling units for:

- Reactor Auxiliary Building Electrical Equipment Protection Rooms Ventilation System
- Reactor Auxiliary Building Non-Nuclear Safety-Ventilation System
- Fuel Handling Building Spent Fuel Pool Pump Room Ventilation System



Reason for Change

- Replacing the Essential Services Chilled Water System (ESCWS) chillers.
- Each replacement is expected to take more than the 30 days allowed by the Risk-Informed Completion Time (RICT) Program.
- Extended Allowed Outage Time (AOT) for an inoperable ESCWS loop will allow for replacement of each chiller to be conducted while online.
- One-time application of the extended AOT for each ESCWS loop (A-SA, B-SB).

Description of Change

- The proposed license amendment revises the following Technical Specifications (TS):
 - TS 3.7.13, “Essential Services Chilled Water System” – one-time extension (per loop) of 7-day AOT to 45-day AOT for an inoperable loop
 - Associated TS Action Statements below to add Note reflecting one-time extensions
 - TS 3.1.2.4, “Charging Pumps – Operating”
 - TS 3.5.2, “ECCS [Emergency Core Cooling System] Subsystems – Tavg Greater Than or Equal To 350°F”
 - TS 3.6.2.1, “Containment Spray System”
 - TS 3.6.2.3, “Containment Cooling System”
 - TS 3.7.4, “Emergency Service Water System,” that would apply to the B train only

Current Technical Specifications

PLANT SYSTEMS

3/4.7.13 ESSENTIAL SERVICES CHILLED WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.13 At least two independent Essential Services Chilled Water System loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With only one Essential Services Chilled Water System loop OPERABLE, restore at least two loops to OPERABLE status within 7 days* or in accordance with the Risk-Informed Completion Time Program or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

* Prior to exceeding 72 hours, the compensatory measures described in HNP LAR correspondence letter RA-19-0007 shall be implemented.

Proposed Technical Specifications

LIMITING CONDITION FOR OPERATION

3.7.13 At least two independent Essential Services Chilled Water System loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

Add: #

ACTION:

With only one Essential Services Chilled Water System loop OPERABLE, restore at least two loops to OPERABLE status within 7 days* or in accordance with the Risk-Informed Completion Time Program or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

- # A one-time Allowed Outage Time (AOT) extension for an inoperable Essential Services Chilled Water System loop allows 45 days to restore the inoperable loop to OPERABLE status during the period of time in which the respective Essential Services Chilled Water System chiller is being replaced. This extension to 45 days is applicable once per loop to facilitate the replacement of both Essential Services Chilled Water System chillers. The one-time AOT extension shall expire upon completion of the replacement of both Essential Services Chilled Water System chillers or by December 31, 2029, whichever occurs earliest.

Proposed Technical Specifications

- Current Note for TS 3.1.2.4, TS 3.5.2, TS 3.6.2.1, TS 3.6.2.3, TS 3.7.4
 - * One [system name] train is allowed to be inoperable for a total of 7 days to allow for maintenance on the Essential Services Chilled Water System and air handlers supported by the Essential Services Chilled Water System. Prior to exceeding 72 hours, the compensatory measures described in HNP LAR correspondence letter RA-19-0007 shall be implemented.
- Proposed revision to Note
 - * One [system name] train is allowed to be inoperable for a total of 7 days to allow for maintenance on the Essential Services Chilled Water System and air handlers supported by the Essential Services Chilled Water System **or 45 days to allow for the replacement of the Essential Services Chilled Water System chillers.** Prior to exceeding 72 hours, the compensatory measures described in HNP LAR correspondence letter RA-19-0007 shall be implemented. **The one-time Allowed Outage Time (AOT) extension to 45 days shall expire upon completion of the replacement of both Essential Services Chilled Water System chillers or by December 31, 2029, whichever occurs earliest.**

Technical Evaluation

- General Design Criteria: related to ESCWS
 - GDC-2: Design bases for protection against natural phenomena
 - GDC-44: Cooling Water
 - GDC-45: Inspection of cooling water system
 - GDC-46: Testing of cooling water system
- General Design Criteria: related to ECCS
 - GDC-35: Emergency core cooling
 - GDC-36: Inspection of emergency core cooling system
 - GDC-37: Testing of emergency core cooling system
- Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis"
- Regulatory Guide 1.177, "Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications"

Current Compensatory Measures for 7-day AOT and RICT:

- Air handlers that support the operable Charging Safety Injection Pump (CSIP) Rooms and Switchgear Rooms and the operable ESCWS chiller will be posted protected.
- The Fire Protection tracking log will be reviewed for fire hazards and fire impairments.
- Transient combustibles and hot work in fire risk-sensitive areas will be limited.
- Restrictions on work activities will be in place that involve components that if lost or failed could result in a plant trip or transient.
- Operator actions for the CSIP area cooling, Switchgear Room cooling, and Auxiliary Relay Panel Room cooling, if needed following a loss of HVAC, will be briefed with Operations.
- The fan used for the CSIP area cooling will be pre-staged and verified to be functional.
- Outages of equipment will be limited or avoided on the operable ESCWS train, Motor-Driven and Turbine-Driven Auxiliary Feedwater Pumps, Service Water System, Emergency Diesel Generators, Alternate Seal Injection System, & Dedicated Shutdown Diesel Generator System.

Application of the RIPE Process

- Applicable Guidance Documents:
 - Safety Impact Characterization Guidance for Implementing the Risk-Informed Process for Evaluations, Revision 3, (ADAMS Accession No. ML23354A152)
 - TSG-DORL-2021-01, Revision 4 – NRR Temporary Staff Guidance, Risk-Informed Process for Evaluations, May 2024 (ADAMS Accession No. ML23354A150)
 - NEI 21-01, Revision 3, Industry Guidance to Support Implementation of NRC's Risk-Informed Process for Evaluations, December 2023
- HNP meets the criteria to utilize the RIPE Process
 - Technically acceptable PRA
 - TSTF-505, "Provide Risk Informed Extended Completion Times – RITSTF Initiative 4b"
 - Approved per License Amendment 184 (ADAMS Accession No. ML21047A314)
 - Robust Integrated Decision-Making Panel (IDP)
 - Implementation of 10 CFR 50.69 (ADAMS Accession Nos. ML19192A012 and ML21316A248)

Application of the RIFE Process

Does the issue result in any impact on the frequency of occurrence of an accident initiator or result in a new accident initiator? No.

- The amendment does not add or remove plant systems, structures, or components (SSCs)
- No change to the basic design, operation, or function of affected systems
- No new or different accidents are created by the proposed amendment
- No impact to accident initiators or safety analysis; no increase to accident risk.

Does the issue result in any impact on the availability, reliability, or capability of SSCs or personnel relied upon to mitigate a transient, accident, or natural hazard? Yes.

- The amendment does not alter plant design or design criteria for SSCs.
- Extends AOT for one train ESCWS inoperable
- Operable train remains available to provide 100% flow necessary for cooling
- Prior to exceeding 72 hours from LCO entry, will implement compensatory actions outlined in TS

Application of the RIPE Process

Does the issue result in any impact on the consequences of an accident sequence? No.

- The amendment will not impact any accident evaluated in the Updated Final Safety Analysis Report (UFSAR) or result in a new accident.
- No impact to the design bases limits for a fission product barrier – Fuel Cladding, Reactor Coolant System Boundary and Containment.
- No impact on radiological dose.

Does the issue result in any impact on the capability of a fission product barrier? No.

- Maintain ability to continuously remove decay heat.
- No challenge to reactor coolant pressure boundary or Containment.
- Proposed AOT extension has no impact on physical barriers.

Application of the RIPE Process

Does the issue result in any impact on defense-in-depth capability or impact in safety margin? No.

- Current level of defense-in-depth is maintained
- Operable ESCWS train remains available to cool areas of plant equipment needed to mitigate the event.
- No impact to safety analysis acceptance criteria in the UFSAR
- Prior to exceeding 72 hours of the proposed AOT, compensatory actions are taken in accordance with TS

Application of the RIPE Process

- HNP PRA Model
 - Consistent with that utilized for the RICT Program
 - Assesses internal events, internal flooding, and fire hazards.
 - Does not quantitatively assess seismic, high winds, or external flooding hazards based on meeting screening criteria
 - No specific concerns related to these for this submittal
- In order to characterize as minimal safety impact:
 - Contribute less than 5×10^{-7} /year to core damage frequency (CDF)
 - Contribute less than 5×10^{-8} /year to large early release frequency (LERF)
 - Cumulative risk is acceptable
 - If baseline risk remains less than 1×10^{-4} /year for CDF and less than 1×10^{-5} /year for LERF once the impact of the proposed change is incorporated into baseline risk.

■ Strategy

- Quantitative Risk Assessment to calculate change in CDF and LERF
- When the A-SA ESCW chiller is removed from service for replacement the A-SA chiller will be out of service with Emergency Service Water (ESW) piping to and from the chiller isolated under a clearance.
 - Basic Event for A-SA ESCW chiller removed for service for maintenance set to 1.0
- When the B-SB ESCW chiller is removed from service for replacement the B-SB chiller will be out of service with Emergency Service Water (ESW) piping to and from the chiller isolated under a clearance.
 - Basic Event for A-SA ESCW chiller removed for service for maintenance set to 1.0
- Potential Flooding Impact from chiller replacement are from Maintenance-induced flood originating from HVAC Chiller Units Initiating Events
- Duration of chiller replacement maintenance is not part of the Maintenance-induced flood frequency equation

- Assumptions
 - The ESCW chillers will be replaced one at a time, each within a 45-day period.
 - Risk Management Actions (RMAs) will be taken to qualitatively minimize the plant risk during the 45-day chiller replacement period.
 - Protect safety train equipment.
 - Limit scheduled maintenance on safety train equipment.
 - Scheduled test and maintenance activities that could result in a plant trip or transient due to human error or component failure will be minimized.

■ Quantitative Risk Characterization

- The objective of the quantitative risk assessment is to calculate a change in CDF and LERF as the difference between the baseline risk and the risk with either the A-SA or B-SB Train ESCW chiller Out Of Service (OOS) for the chiller replacement period of 45 days.

Metric	PRA Base Model Risk	Configuration-Specific Risk	Delta Risk	NRC RIPE Criteria for Minimal Safety Impact
CDF	4.2200E-5	4.5124E-5 (A) 4.5687E-5 (B)	3.6044E-7 (A) 4.2984E-7 (B)	< 5.0E-7
LERF	3.6071E-6	3.7320E-6 (A) 3.7025E-6 (B)	1.5395E-8 (A) 1.1759E-8 (B)	< 5.0E-8

- ESCWS AOT Extension
 - Shearon Harris Nuclear Power Plant, Unit 1
 - NRC approved amendment addressing extension of ESCWS AOT from 72 hours to 7 days (by letter dated March 31, 2020, ADAMS Accession No. ML20050D371).

- Successful use of RIPE
 - Palo Verde Nuclear Generating Station Units 1, 2, and 3
 - LAR using RIPE to modify Completion Time for Condition B of Technical Specification Limiting Condition for Operation (LCO) 3.5.1 and LCO 3.5.2 from 24 hours to 10 days.
 - Approved per letter dated July 17, 2024 (ADAMS Accession No. ML24159A470)

Schedule

- IDP targeted for late September 2025
- Submit LAR in November 2025
- First chiller replacement targeted for Spring 2027
- Second chiller replacement targeted for Spring 2028

