



**Farley Nuclear Plant**  
**Residual Heat Removal**  
**Autoclosure Interlock Deletion**  
**April 23, 2014**

# Farley Nuclear Plant RHR ACI Deletion

## Agenda

- Introductions
- Purpose of Meeting
- Background
- Issue for Discussion
- Proposed Approach
- Summary and Conclusions

# Farley Nuclear Plant RHR ACI Deletion

## Purpose of Meeting

Discuss the approach and obtain NRC feedback and expectations on the technical justification for the elimination of the Residual Heat Removal System (RHR) Autoclosure Interlock (ACI).

# Farley Nuclear Plant RHR ACI Deletion

## Background

- RHR Autoclosure Interlock
  - Provides protection against overpressurizing the low pressure RHR system by the high pressure RCS
  - Ensures there is a double barrier between the RCS and RHR system when the plant is at normal operating conditions
  - Both RHR isolation valves close automatically if the pressure increases above the bistable setpoint
  - Helps prevent interfacing system LOCAs

# Farley Nuclear Plant RHR ACI Deletion

## Background

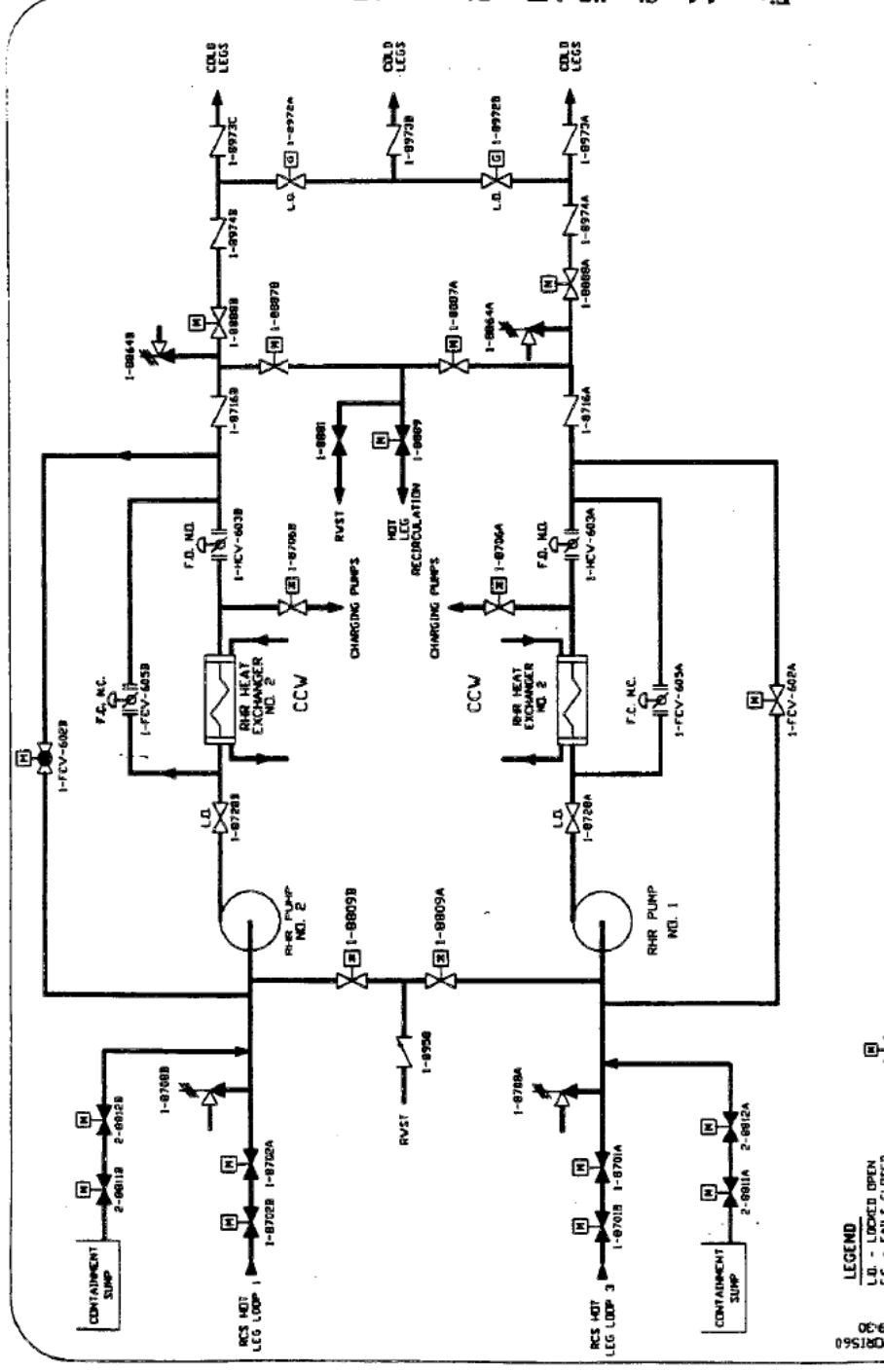


Figure 1-1. Simplified Flow Diagram of Farley Residual Heat Removal System

# Farley Nuclear Plant RHR ACI Deletion

## Background

- Issue with RHR ACI
  - AEOD report “Decay Heat Removal Problems at U.S. Pressurized Water Reactors” dated December 1985, identifies 130 loss of RHR events in US PWRs between 1976 and 1983
  - 37 were caused by automatic closure of the RHR suction/isolation valves
  - Closure of the RHR valves results in a loss of cooling during shutdown (low pressure) operation

# Farley Nuclear Plant RHR ACI Deletion

## Background

- NRC internal Memo on RHR ACI dated January 1985 stated:
  - A request to remove the ACI feature should be substantiated by proof that the change is a net improvement to safety, and
  - Should as a minimum address the following:
    - The means available to minimize Event V concerns.
    - The alarms to alert the operator of an improperly positioned RHRs MOV.
    - The RHRs relief valve capacity must be adequate.
    - Means other than the ACI to ensure both MOVs are closed (e.g., single switch actuating both valves)
    - Assurance that the function of the open permissive circuitry is not affected by the proposed change.
    - Assurance that MOV position indication will remain available in the control room, regardless of the proposed change.
    - An assessment of the proposed change's effect on RHRs reliability, as well as on LTOPs concerns.

# Farley Nuclear Plant RHR ACI Deletion

## Background

- PWROG Program – RHR System ACI Removal
  - WCAP-11736-A, “Residual Heat Removal System Autoclosure Interlock Removal Report for the Westinghouse Owners Group”
  - Sorted Westinghouse NSSS plants into four groups
  - Provided assessments for four reference plants to demonstrate the change is a net improvement to safety
    - Interfacing system LOCA analysis
    - RHR unavailability analysis
    - LTOP/overpressurization analysis



# Farley Nuclear Plant RHR ACI Deletion

## Background

- NRC SE on WCAP-11736-A: Staff Position
  - Removal of ACI for W NSSS plants can produce a net safety benefit provided five key improvements are in place
    - Alarms on RHR suction valves
    - Valve position indication
    - Procedural improvements
    - Power removed from RHR suction valves
    - Sizing of RHR valve operators
  - WCAP can be referenced in licensee's plant-specific submittals to show compliance with items that are not plant specific

# Farley Nuclear Plant RHR ACI Deletion

## Background

- NRC SE on WCAP-11736-A
  - Section 2.4 – The effects of ACI removal upon plant safety must be evaluated on a plant-by-plant basis because of numerous plant-specific differences
  - Section 2.6 – The licensee should do sufficient PRA and safety analysis to ensure that its plant will not show results that will invalidate the conclusions of WCAP-11736
  - Requires submitting a LAR for the Tech Spec change
    - SR 3.4.14.2 in Tech Spec 3.4.14, “RCS PIV Leakage,” will be deleted

# Farley Nuclear Plant RHR ACI Deletion

## Background

- Previous Farley RHR ACI Removal Program
  - WCAP-11746, Rev. 1, “Residual Heat Removal System Autoclosure Interlock Removal Report for the Joseph M. Farley Nuclear Plant Units 1 and 2” (April 1996) documents the justification for RHR ACI deletion at Farley
  - Addresses NRC’s requirements
  - Provides plant specific PRA for impact of RHR ACI removal on plant safety
    - Interfacing system LOCA analysis
    - RHR unavailability analysis
    - Low temperature overpressurization analysis

# Farley Nuclear Plant RHR ACI Deletion

## Issue for Discussion

- The Farley specific analysis documented in WCAP-11746, Rev. 1 was completed in 1996
- The PRA analysis may not meet RG 1.200
- The analysis may not be acceptable to NRC Staff reviewers
- Potential issues with:
  - Fault trees
  - Data
  - Human reliability analysis
  - Event frequencies

# Farley Nuclear Plant RHR ACI Deletion

## Proposed Approach

- Step 1: NRC meeting to discuss the proposed approach and obtain the Staff's feedback
- Step 2a: Assess the technical adequacy of the WCAP-11746, Rev. 1 models/analyses against ASME/ANS Standards and RG 1.200
  - Interfacing system LOCA analysis
  - RHR unavailability analysis
  - Low temperature overpressurization analysis

# Farley Nuclear Plant RHR ACI Deletion

## Proposed Approach

- Step 2b: Categorize the deficiencies in meeting the PRA Standards
  1. Conservative aspect of the model that does not need to be addressed
  2. No impact on the decision-making process
  3. Could impact the results, but can be addressed via high level quantitative or qualitative assessment
  4. Impacts a key aspect of the analysis/models

# Farley Nuclear Plant RHR ACI Deletion

## Proposed Approach

- Step 3: Model Changes and Quantification
  - Deficiencies will be addressed and these may be addressed with:
    - Model changes
    - Qualitative assessments
    - Sensitivity analyses
  - Data from most recent Farley PRA model will be used
  - All models will be re-quantified to demonstrate the acceptability of the RHR ACI deletion

# Farley Nuclear Plant RHR ACI Deletion

## Summary and Conclusions

- Assess the technical adequacy of the WCAP-11746, Rev. 1 models/analyses against ASME/ANS Standards and RG 1.200
- Categorize the deficiencies in meeting the PRA Standards
- Model important changes and complete quantification
- Submit a LAR containing the above justification that supports the Tech Spec change
- NRC feedback on the proposed approach



# Questions or Comments?