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NRC Public Meeting

Peach Bottom

Proposed Actions to Address Containment Accident Pressure (CAP) Credit

02/22/11

Agenda

- Introductions
- Meeting Purpose
- ECCS Pump NPSH:
  - Current Licensed CAP Credit
  - Preliminary Results / Impacts / Margins
- Proposed Modifications to Address CAP
- Next Steps

Meeting Purpose

- Familiarize Staff with Proposed Approach for Addressing Containment Accident Pressure Credit in Support of EPU
  - Proposed Modifications that would eliminate the need to request additional CAP credit
    - Proposed Modifications' impact on existing CAP Credit
  - Preliminary results, expected outcomes, and plant and operational impacts
- Discuss Next Steps

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ECCS Pump NPSH

DBA-LOCA

CLTP with CAP				
ECCS Pump	Maximum SP Temperature (˚F)	Minimum Containment Pressure Available, MCPA (psig)	Containment Overpressure Required, COPR (psig)	NPSH Margin = MCPA - COPR (feet)
CS – ST	149	7.0	0.0	16.2
RHR - ST	149	7.0	0.6	14.8
CS - LT	206	7.0	4.8	5.4
RHR - LT	206	7.0	6.1	2.1

No CAP with modifications (preliminary data - analyzed at 120% OLTP)				
ECCS Pump	Maximum SP Temperature (˚F)	NPSHA @ Max. SP Temp. (feet)	NPSHR 3% (feet)	NPSH Margin = NPSHA – NPSHR3% (feet)
CS - ST	155	34.0	28.0	6.0
RHR - ST	155	32.1	26.8	5.3
CS - LT	185.3	26.0	21.3	4.7
RHR - LT	185.3	23.8	16.0	7.8

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ECCS Pump NPSH

Special Events (Non-Design-Basis)

CLTP with CAP				
Event - Pump	Maximum SP Temperature NPSH Basis (˚F)	Containment Pressure, CP (psig)	COPR (psig)	NPSH Margin = CP - COPR (feet)
SBO - RHR	190	4.6	2.1	6.0
ATWS - RHR	190	4.6	2.1	6.0
App. R - RHR	206	6.9	5.8	2.6

No CAP with modifications (preliminary data - analyzed at 120% OLTP)				
Event - Pump	Maximum SP Temperature (˚F)	NPSHA @ Maximum SP Temperature (feet)	NPSHR 3% (feet)	NPSH Margin = NPSHA – NPSHR3% (feet)
SBO - RHR	196.0	19.5	16.0	3.5
ATWS - RHR	168.3	30.8	16.0	14.8
App. R - CS	196.4	21.9	21.3	0.6
App. R - RHR	204.3	16.5	16.0	0.5

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Proposed Changes to Address CAP

ECCS Pump NPSH - Events	Proposed Changes
DBA-LOCA Short-Term (first 10 minutes)	➢ Reduce RHR runout flow rate by adding hydraulic resistance
DBA-LOCA Long-Term (beyond 10 minutes)	➢ RHR HX cross-tie modification ➢ Increase RHR HX performance (reduce fouling) ➢ Decrease RHR flow rate ➢ NPSHR 3% curves
Station Blackout (SBO)	➢ Increase RHR HX performance (reduce fouling) ➢ Decrease RHR flow rate ➢ NPSHR 3% curves ➢ Credit CST as suction source for RCIC pump
ATWS (Peak Pool Temperature)	➢ Increase SBLC Boron Enrichment ➢ Increase RHR HX performance (reduce fouling) ➢ Decrease RHR flow rate ➢ NPSHR 3% curves
Appendix R	➢ Increase RHR HX performance (reduce fouling) ➢ Decrease RHR flow rate ➢ NPSHR 3% curves ➢ Increase/Supplement CST Inventory

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DBA-LOCA Short-Term (1st 10 minutes)

Core Spray – no modifications

- RHR Pump (LPCI) – Runout Flow Rate: Current analysis requires CAP (from 7.5 to 10 minutes)
  - Current: 12,000 gpm
  - Post Mod: 10,600 gpm (adjust limit stops to increase HX inlet MOV hydraulic resistance)

- Margins at 10 minutes (maximum pool temperature = 155˚F):
  - RHR (LPCI) pumps at 10,600 gpm (runout): 5.3 feet (18.6˚F)
  - Core Spray pumps at 4,030 gpm (runout): 6.0 feet (20.5˚F)

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DBA-LOCA Long-Term (beyond 10 minutes)

Core Spray – no modifications, no new operator actions

- RHR Pump (LPCI) – Core and Containment Cooling Analysis Flow Rate:
  - Current: 10,000 gpm
  - Post Mod: 8,600 gpm (analysis value – operators maintain flow within 8,600 - 10,600 gpm range in accordance with EOP NPSH curves)
- Margins at peak pool temperature, 185.3˚F:
  - RHR (LPCI) pumps at 8,600 gpm (throttled): 7.8 feet (15.6˚F)
  - Core Spray pumps at 3,125 gpm (throttled): 4.7 feet (9.9˚F)

Results / Margins

- Peak Suppression Pool Temperatures

	Current	Post Mod (@120% OLTP)
DBA-LOCA		
Short-term	150˚F	155˚F
Long-term	206˚F	185˚F
PCT (2200˚F limit)		
Small-break	1865˚F	1904˚F*
Large-break	1653˚F	<1700˚F*

* PBAPS remains small-break LOCA limited. Large break PCT is affected by LPCI flow rate reduction, but small-break LOCA remains limiting.

- EDG electrical loading
  - Remains within 2000 hour rating
  - EDG E2 0-10 minute loading - restored to within 2000 hour rating

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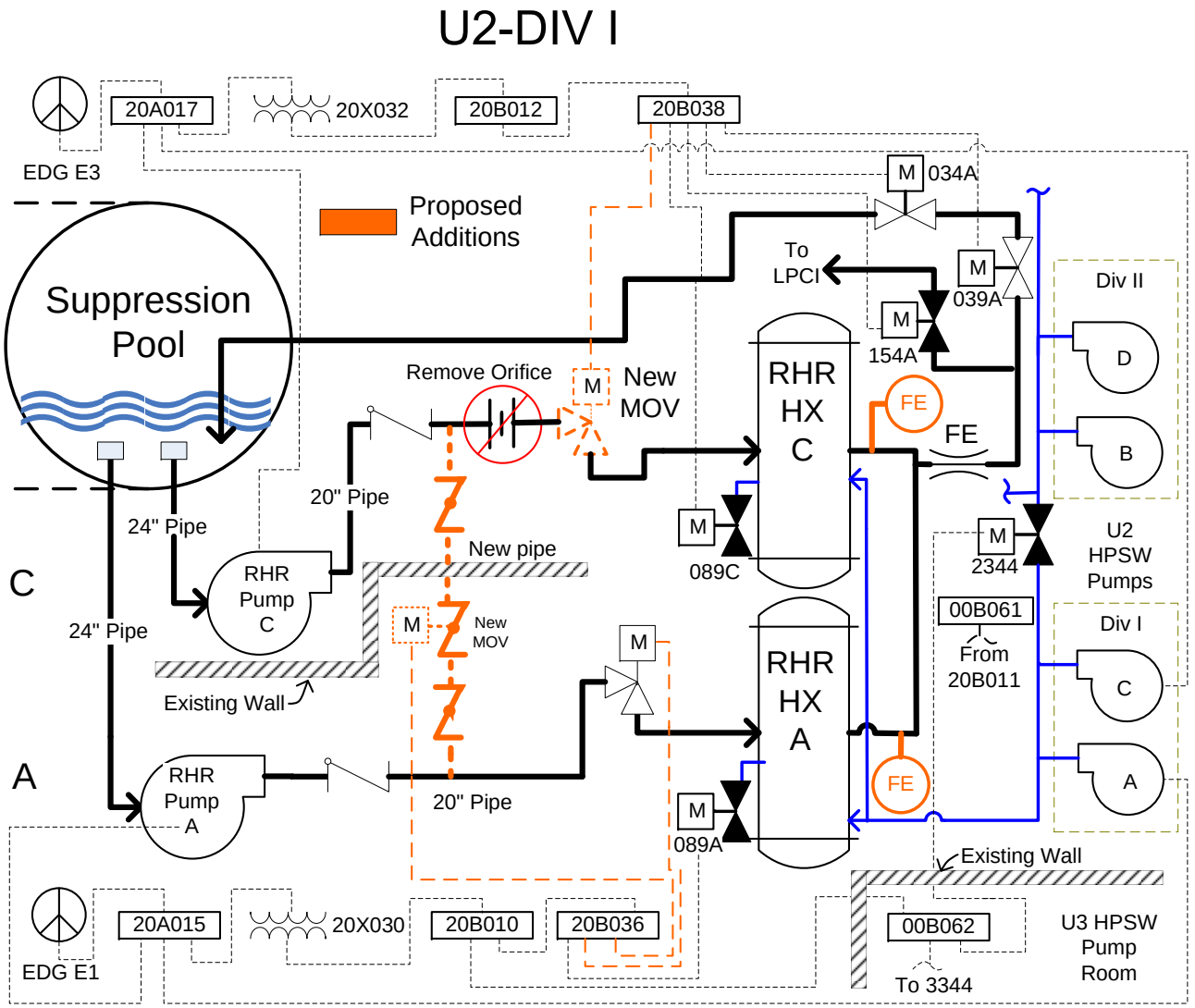
RHR HX Cross-tie Modification Concept



RHR HX Cross-tie Modification Concept

- Cross-tie RHR pump discharge lines in the same division:
  - 1 normally closed cross-tie MOV controlled from control room
  - 2 normally open manual isolation valves in cross-tie piping
  - 1 Throttling valve (MOV controlled from control room) in RHR supply line to each HX
  - Approx. 25 – 30 ft. pipe for cross-tie line
  - Flow elements with instruments - indicate RHR flow in control room (RG 1.97)
- Containment cooling capability increased approximately 164% of existing capability

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RHR HX Cross-tie - Operations Impact

- Impact to Operators – New Operator Actions
  - Start 1 additional HPSW pump within 1 hour
  - Open MOV to establish HPSW flow through 2nd HX
  - Open new cross-tie MOV within 1 hour
  - Split RHR flow equally to 2 HXs within 1 hour

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RHR HX Cross-tie - Tech Spec and Bases

- Spec 3.6.2.3 RHR Suppression Pool Cooling (Two Loops)
  - LCO requires 2 Operable subsystems. Each subsystem consisting of 1 RHR pump and associated HX
  - Currently 4 subsystems available to meet LCO
  - With modification, an Operable subsystem will require 1 RHR pump, the cross-tie, and both HXs
  - Post modification, 2 subsystems will be available meeting the LCO requirement. Bases definition of subsystem Operability will be modified to reflect new configuration

- Spec 3.7.1 High Pressure Service Water (Two Loops)
  - LCO requires 2 Operable subsystems. Each subsystem consisting of 1 HPSW pump and associated HX
  - Currently 4 subsystems available to meet LCO
  - With modification, an Operable subsystem will require 2 HPSW pumps and 2 HXs
  - Post modification, 2 subsystems will be available meeting the LCO requirement. Bases definition of subsystem Operability will be modified to reflect new configuration

- Spec 3.5.1 ECCS Surveillance
  - Cross-tie Hx MOVs increase hydraulic resistance and limit runout flow
  - SR to demonstrate adequate LPCI flow will be changed to reflect new analytical assumptions

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Proposed SBO Solution

- Proposed Changes
  - Increase RHR HX performance (reduce fouling)
  - Decrease RHR pump flow rate (consistent with LOCA)
  - NPSHR 3% curves
  - Eliminates Operator Action of Swapping Suction Source to Pool
    - modifications ensure CST remains available as RCIC suction source

Results:

- Maximum suppression pool temperature: 196˚F
- RHR pump NPSH margin at maximum suppression pool temperature: 3.5 feet (6.2˚F)

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Proposed ATWS Solution

- Proposed Changes
  - Increase SBLC Boron Enrichment
    - Achieves shutdown sooner thereby lowering pool temperature
  - Increase RHR HX performance (reduce fouling)
  - Decrease RHR pump flow rate (consistent with LOCA)
  - NPSHR 3% curves

Results:

- Maximum suppression pool temperature: 168.3˚F
- RHR pump NPSH margin at maximum suppression pool temperature: 14.8 feet (33.9˚F)

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Appendix R – 4 Fire Safe Shutdown (FSSD) Methods

All FSSD Methods end with RHR aligned in Alternate Shutdown Cooling (ASDC)

- RHR aligned to RPV through LPCI injection valve or
  CS aligned to RPV through CS injection valve
- RPV water level above main steam lines
- ADS SRV open to provide flow path back to suppression pool

Method	Mitigating System(s)
A	RCIC
B	HPCI
C	Low Pressure ECCS ▪ Core Spray Available (CS (RPV inventory) and RHR in torus cooling) ▪ Core Spray Not Available (only RHR credited)
D	Shutdown from Outside the Control Room - HPCI

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Proposed Appendix R Solution

Proposed Changes

- Increase RHR HX performance (reduce fouling)
- Decrease RHR pump flow rate (consistent with LOCA)
- NPSHR 3% curves
- Changed operator response time
- Supplement CST inventory
  - Credit Refueling Water Tank volume
- Modifications to ensure suction source (CST) remains available
- Raise Torus high-level suction swap-over setpoint

Results:

- Maximum suppression pool temperature: 204.3˚F
- RHR pump NPSH margin at maximum suppression pool temperature: 0.5 feet (0.7˚F)
- Appendix R PCT remains below 1500˚F limit

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Summary - Addressing CAP

- CAP Credit for DBA-LOCA and Special Events Can be Eliminated Through:
  - Modifications to
    - Increase RHR HX capacity
    - Reduce RHR flow rate
    - Increase SBLC enrichment
    - Credit additional CST inventory
  - Improved RHR Hx performance
  - Use of NPSHR 3% curves

Next Steps

- Conduct Follow-up Meeting
  - Further discussion and feedback regarding proposed solutions to CAP credit
  - Discuss need to address CAP solutions as part of EPU application

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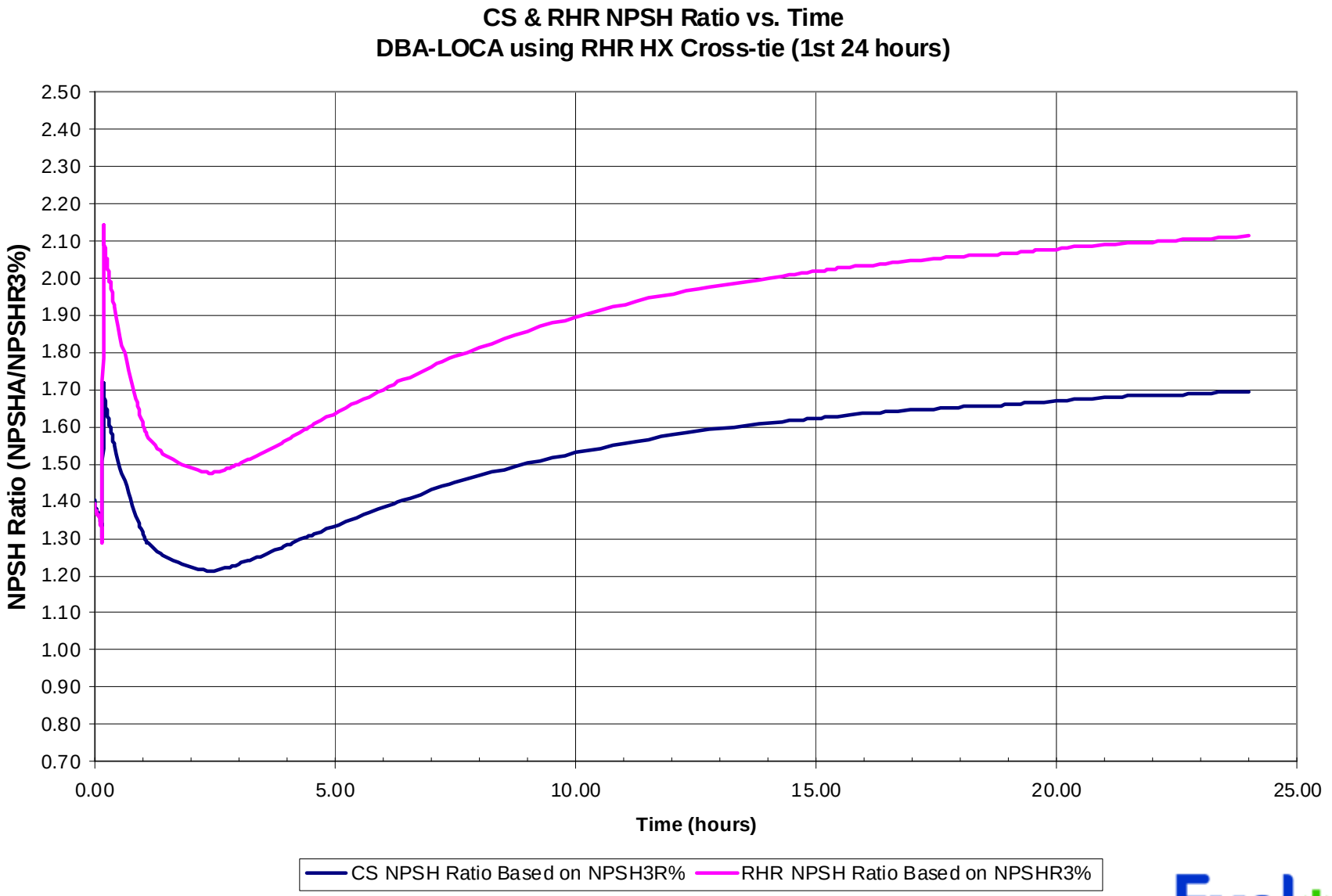
Supplementary Information

ECCS Pump NPSH



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