

## PMLevyCOLPEm Resource

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**From:** Habib, Donald  
**Sent:** Thursday, August 27, 2015 7:19 AM  
**To:** PMLevyCOLPEm Resource  
**Subject:** RE: Levy/Lee Public Meeting (MCR Heatup and Condensate Return)

-----Original Appointment-----

**From:** Kitchen, Robert [mailto:Robert.Kitchen@duke-energy.com]  
**Sent:** Wednesday, August 26, 2015 5:17 PM  
**To:** Kitchen, Robert; Thornton, James R; Waters, David; Steve Franzone (Steve.Franzone@FPL.com); Hughes, Brian; Habib, Donald; Jennifer Meneely (meneelje@westinghouse.com); Cross-Dial, Andrea; APRIL R RICE (ARICE@scana.com)  
**Cc:** 'DeLong, Richard A'; 'Eddie Grant'  
**Subject:** [External\_Sender] Levy/Lee Public Meeting  
**When:** Thursday, August 27, 2015 2:00 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** 888-790-9491 (90617#)

Discussion topics:

1. MCR Heat Load Analysis
2. PRHR long term operation

### MCR Heat Load Analysis

Below is a table showing what the staff understands is in the departure and the DCD, but there are some gaps in the information. The staff would like you to fill in the missing information and correct/clarify any incorrect information. We would like to discuss in a future public teleconference, as appropriate.

Time (days)	Certified Design		Levy Departure		
	Acceptance Criteria <sup>1</sup>	MCR Heat-up Analysis	Acceptance Criteria <sup>1</sup>	MCRE	MCR Heat-up Analysis
		MCRE	Adjacent Rooms		Adjacent Rooms
0	75°F (60%RH)	Assume at 75°F (60%RH)	85°F (?%RH)	Assume at 75°F	Assume at 85°F
0 - 3	95°F (60%RH)	85.8°F (?%RH)	95°F (60%RH)	< 95°F (?%RH) <sup>2</sup>	< 95°F (?%RH) <sup>3</sup>
4 - 7	95°F (70%RH)	4.5°F above average outdoor air temp (?%RH)	115°F (35%RH)	108.5°F (?%RH) (7.5°F above the maximum normal air temp site parameter of 101°F)	< 115°F (?%RH) <sup>3</sup>

<sup>1</sup> It was not clear from reading Duke's submittals whether or not the acceptance criteria is the same for both human performance and equipment qualification.

<sup>2</sup> It was not clear from reading Duke's submittals what was the worst case calculated temperature and RH in the MCRE from the GOTHIC analysis. Duke's submittal implies it was below 95°F and the February 2015

meeting slides shows a temperature curve below 95°F, but no specific temperature and RH values were provided in Duke's submittal or proposed markups.

<sup>3</sup> It was not clear from reading Duke's submittals what was the worst case calculated temperature and RH in all of the adjacent rooms from the GOTHIC analysis. Duke's submittal implies it was below 95°F for the first 3 days and below 115°F at 7 days, but no specific temperature and RH values were provided in Duke's submittal or proposed markups.

Additional Questions:

1. What is the "average outdoor air temperature" used in the certified design MCR heat-up analysis (post 72 hours)?
2. What is the basis for the change from "average outdoor air temperature" to "Maximum normal air temperature?"
3. Confirm the computer(s) supplying the safety related VDUs remain operable. (Specifically, are the rooms they are located in cooled by safety related cooling system?)
4. Identify the location (rooms) of safety-related I&C equipment located in rooms outside the MCR
5. Provide the analysis results of the temperature for first 7 days in non-MCR rooms containing equipment having 115F EQ temperature limit

#### PRHR Long Term Operation

- LOFTRAN analysis was used to evaluate PRHR closed loop ability to achieve and maintain safe, shutdown (SSD).
- The LOFTRAN code is not suited to consider ambient heat loss (adiabatic conditions assumed).
- The LOFTRAN analysis confirmed that AP1000 can achieve 420F in 36 hours and maintain this condition for at least 14 days using conservative, non-bounding analysis
- WEC has recently conducted sensitivity studies using RELAP that considers ambient heat loss (heat loss from primary systems to containment) to assess the ability of PRHR to achieve and maintain SSD in closed loop operation
- As expected, consideration of ambient heat loss results in PRHR closed loop maintaining safe, stable conditions for a much longer duration (about 40 days)
- An unexpected result is that RELAP studies with ambient heat loss show that PRHR closed loop cannot maintain 420F beyond 2-4 days. Apparently, the PRHR HX mass flow is reduced as RCS pressure decreases and two phase flow occurs in the hot leg and PRHR HX inlet piping
- Preliminary evaluations with RELAP indicate that 420F is achieved in 36 hours but within 2-4 days, the RCS temperature rises to about 460-480F. This safe, stable condition is maintained for about 40 days.
- WEC is continuing to validate and assess results using RELAP but WEC has preliminarily concluded that PRHR closed loop does not have the capability to maintain 420F beyond 2-4 days using conservative, non-bounding conditions assuming loss of pressurizer steam bubble
- Levy COLA will require revision to reflect the final analysis for SSD
- WEC must complete studies and develop supporting calculations
- Duke must review and accept the final calculations
- If RELAP results are confirmed, at a minimum, changes to the following FSAR sections will be required:
  - FSAR 6.3.1.2.1 (Non Safety Design Basis – Long Term Core Decay Heat Removal)
  - FSAR 7.4 (Systems Required for Safe Shutdown)
  - Possibly also FSAR 19E.4.10.2

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**Received Date:** 8/27/2015 7:19:12 AM  
**From:** Habib, Donald

**Created By:** Donald.Habib@nrc.gov

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