

*A. Miller*  
*J. Wiggins*  
**From:** A. Randolph Blough, *RI*  
**To:** hjm1; Jtw1  
**Date:** 3/12/04 3:21PM  
**Subject:** Re: Fwd: HC info on LPRM strings & sept 2003 recriticality

Hub, Some of the info you had asked for. Details attached.

The LPRMs have a bad history, but PSEG attention to them may be improving.

The reactivity control event of sept was discussed within the branch at the time. Mel Gray planned addl followup and put it in as a PIR sample to be reviewed after the licensee root cause was done. In fact, it's listed as a PIR sample in the EOC package, but the description is very general, "reactivity event root cause," and some folks, including me, would have thought it was the Spring 2003 reactivity event, not the Fall 2003 reactivity event!

**Glenn and Rich,** If HC has a s/d anytime soon, we may want to consider some ops specialist observation of the S/U, to evaluate the impact on the operators of all the instrument conditions, CRD workarounds and other equip probs.

Randy

Glenn Meyer 03/12/04 10:07AM >>>

Mel's attached email confirms USA's conclusion that LPRM failures are higher than normal but within TS requirements.

**CC:** Brian Holian; Glenn Meyer; Richard Conte; wdl

*C-29*

**From:** Mel Gray / RJ  
**To:** Glenn Meyer  
**Date:** 3/11/04 3:57PM  
**Subject:** HC info on LPRM strings

Yes. HC has a high number of LPRM failures. While TS have been met (adequate minimum margin), this material condition of the LPRM cards has required increased CM work.

Specifics: HC has 172 LPRMs in 43 strings. They feed 6 APRM channels, 2 RBM channels and the process computer. Each APRM channel has 21-22 LPRMs inputs. RBM channels receive input from LPRMs surrounding the selected rod.

Currently there are 10 LPRMs bypassed out of 172. Five of the ten should be returned to service (un-bypassed) after TIP calibration. Three require undervessel work. Two require troubleshooting. In the past year the number of bypassed LPRMs has been as high as 16 in October 2003. After operators highlighted the issue to plant manager, increased management focus brought number down to 4 in November 2003. Back up to 10 now (with 5 ready to be restored to service after TIP cal) Tech issues initiated this month.

TIP cals are performed every six weeks. PSEG intends to move TIP trace up to next week to return 5 LPRMs to service.

HC has a high number of LPRM failures. Average for this year so far is about 4-5 per month. Failure mode is usually spiking or drifting. When this occurs LPRMs are bypassed, the cards (outside D/W) are cleaned and IV curves checked by applying high voltage.

A tech issues was started this month (3/04) to improve LPRM channel reliability. However, system is not in maintenance rule a(1) status. MR performance criteria are 6 system functional failures/36 months. Functional failures are generally defined as RBM channel inop or APRM channel inop.

The 10 LPRMs that are bypassed have not resulted in an inoperable APRM channel or RBM channel  
Applicable TS are as follows:

APRM channels: TS Table 3.3.1-1 item (e) requires at least two LPRM inputs per level or less than 14 inputs to an APRM channel.

RBM channels: Bases for TS 3/4.1.4 states that a RBM channel are operable if greater than or equal to 50% of LPRM inputs for each level are available for a selected control rod.

**CC:** Marc Ferdas

**From:** Glenn Meyer *REI*  
**To:** Blough, A. Randolph  
**Date:** 3/12/04 7:39AM  
**Subject:** Fwd: HC 9/28/03 criticality incident details

Mel's email provides some more information about the Hope Creek startup incident in which the reactor was permitted to go subcritical and then made critical 20 minutes later.

**CC:** Barber, Scott; Holian, Brian; Wingfield, Theodore

**From:** Mel Gray / *RI*  
**To:** Glenn Meyer  
**Date:** 3/11/04 12:36PM  
**Subject:** HC 9/28/03 reactivity condition information

Glenn,

I am faxing up notifications related to the 9/28/03 Hope Creek reactor subcritical condition. (53 pages total!)

They are:

1. Notification #20160314. Initial notification cut on 9/28/03.
2. Notification #20160533. Apparent cause by Ops finished 11/14/03.
3. Notification #20163198 initiated by QA on 10/20/03 for Salem and HC reactivity mgt issues. Root cause evaluation issued 3/3/04. Root cause evaluation and corrective actions presented to CARB yesterday and approved.

Timeline:

The HC 9/28/03 condition is best described in the timeline on pg 15 of notification 20163198. Here is a synopsis with notes added by me:

At 08:46 the reactor was critical after control rod 38-19 was pulled to notch 4. Control rod withdrawal terminated to record critical reactor parameters.

Rod withdrawal recommenced. POAH reached at 09:19.

10:37 With Rx pressure = 110 psig and temp = 340F, control rod withdrawal suspended to give NCOs a break. Rod withdrawal recommenced.

10:45 With reactor pressure = 120 psig, rod withdrawal suspended. (Reason: TS 3.7.4 requires RCIC to be operable with steam dome pressure > 150#. So operators stopped pulling rods at this point to allow for RCIC steam line warming.)

RCIC steam line warm-up commenced. Completed at 11:02.

(Steam line warming cools moderator and adds positive reactivity. However, procedures direct operators to keep flow very low (to avoid RCIC isolation) so not significant. Heat input from previous rod withdrawals dominated because it increased moderator temperature, adding negative reactivity. While rod withdrawals stopped, steady state reached at higher mod temp, and RCIC steam lines were warmed. Overall, negative reactivity balance, and neutron flux decreased while RCIC lines warmed.

10:50 to 11:20 Operators anticipated power decrease and ranged down IRMs to monitor neutron flux.

11:30 SRMs inserted into core to continue neutron flux monitoring .

11:35 RCIC in standby. (Warming took longer too expected or started too late. Not clear)

11:40 Rx is subcritical.

Operators briefed with Reactor Engineering to ensure understanding of conditions. Recommenced control rod withdrawal at 12:00. Rx critical at 12:05 and normal start-up followed.

Inspector review: I remember at the time reviewing the logs and discussing with plant manager. I thought the conditions were well understood and there were not equipment problems. I also remember some discussion within the branch. I thought at the time there may be some imbalance between operator over reliance on training and supervision and procedure direction. I made the judgement to follow their evaluation. (Notification #20160533). (Later as QA was dissatisfied with Ops evaluation, I submitted this as a PIR sample for this year.)

QA reviewed Ops evaluation and disagreed with the focus. Ops focused on management of operator resources to warm RCIC lines in a timely manner. QA review (rightly so) focused on the decision making process to go critical again.

Notification 20163198 initiated to perform root cause evaluation (not apparent cause as was done by Ops by a team). This was completed last week and sent to CARB yesterday. The focus is on reactivity decision making weaknesses and the corrective actions in line with this.

I have not read it in detail. (33 pages long). I am surmising this is the evaluation reviewed by USA Alliance and prominently discussed in their debrief.

Going forward: My suggestions:

1. Validate whether my response to this issue was correct (PIR sample instead of IR documentation last quarter.
2. Since the branch had this evaluation scheduled as a PIR sample when the evaluation was complete, and now the evaluation is complete, perform PIR sample inspection this month or next quarter. (We had suggested DRS -OPS.)

Mel Gray

**CC:** Daniel Orr; Marc Ferdas

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**Subject:** Re: Fwd: HC info on LPRM strings & sept 2003 recriticality  
**Creation Date:** 3/12/04 3:21PM  
**From:** A. Randolph Blough  
**Created By:** ARB@nrc.gov

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