

From: Fred Sears <cfsnuc@engr.psu.edu>
To: "Mendonca, Marvin" <MMM@nrc.gov>, "Dragoun, Thomas" <TFD@nrc.gov>
Date: 1/4/06 10:44AM
Subject: Penn State Breazeale Reactor Instrumentation Event

This email describes an instrumentation event at the Pennsylvania State Breazeale Reactor (PSBR), Docket 50-005, which occurred on January 3, 2006 with the PSBR in the SHUTDOWN condition. This event was discussed at 12:50 PM on Monday, January 3, 2006, with Marvin Mendonca and a message relating to this event was left with Tom Dragoun at 12:59 PM that same day. Because the event happened during a routine reactor checkout with the reactor SHUTDOWN and the reactor was not being operated it is not felt to be a reportable occurrence. This interpretation was discussed with Marvin Mendonca later that day.

During the reactor checkout (daily surveillance procedure prior to operation) on Monday, January 3, 2006, the Reactor Safety System (RSS) power range (PR) linear power channel overpower trip failed to actuate properly. The RSS wide range (WR) linear power channel overpower trip had already been checked and was functioning properly. The computer overpower trip for the PR functioned properly. The failure to actuate properly was observed for both the calibration (CAL) and ramp checks for the PR linear power channel. The RSS overpower trip for the PR functioned properly during subsequent troubleshooting.

The reactor had been last operated on Saturday, December 24, 2005. A review of the checkout and the console printouts for that day as well as interviews of the operators indicated that the RSS PR linear power overpower trip was functioning properly on that date. No operations were conducted between that date and the checkout on the morning of January 3, 2006.

During the checkout two separate checks are performed on the RSS PR channel. The first utilizes a known input signal (CAL) to verify the proper operation of the PR amplifier. This CAL produces a 110% of full power signal that is verified by reading both the RSS PR readout and the console computer readout. A review of available console computer historic information revealed that although the RSS non-operate trip (result of the CAL process) and the computer overpower trip (107% of full power) operated properly the RSS PR overpower trip did not actuate.

The second check uses a ramp input to the RSS PR channel to measure the nominal power level at which the RSS overpower trip occurs (during this check the computer overpower trip is bypassed and the non-operate trip is not called into service as the ramp signal is additive to the normal PR signal and thus is conservative.) During this check the operator terminated the ramp at 117%. The overpower trip should have occurred at 108%. About six seconds after the ramp was terminated (signal returned to zero) the RSS PR overpower trip actuated. This was about 10 to 12 seconds after the ramp had exceeded the 108% level.

No explanation for this failure to operate could be determined. The PR channel was exercised multiple times in an effort to reproduce the

behavior without success. On all subsequent testing the RSS PR overpower trip was observed to actuate as designed. A review of the circuit diagrams was made to determine whether other portions of the circuitry including bypasses could have caused such behavior. None were identified.

The operator performing the checkout was interviewed, the information available from the historic capabilities of the computer console was examined, and testing of the channel was conducted. No causes of such behavior were identified.

It was concluded that the RSS PR linear power overpower trip comparator card had to have suffered a temporary failure. A decision was made to replace that card.

Upon replacement the RSS PR linear power overpower trip comparator card was aligned in accordance with procedures. A partial reactor checkout to verify the replacement was performed on January 3, 2006. A full reactor checkout was performed on January 4, 2006 to verify correct operation of the console including the RSS PR linear power channel.

No previous similar events have been identified.

The event was documented using our event evaluation procedures and our maintenance procedures. The Penn State Reactor Safeguards Committee and university management were informed of the event.

A PSBR management/safety review of the event was conducted on January 3, 2006. Following a further review of the event on January 4, 2006 by the Director and the Associate Director for Operation, the Director authorized return of the PSBR to normal operations.

If you have any questions regarding this event please give me a call.

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Fred Sears
Director, Radiation Science & Engineering Center (RSEC)
Penn State Breazeale Reactor (PSBR)
The Pennsylvania State University
University Park, PA 16802-2301
Phone: 814-865-6351
Fax: 814-863-4840
cfsnuc@enr.psu.edu

CC: Larry Burton <LBurton@enr.psu.edu>, "Eva J. Pell" <ejp@psu.edu>

Mail Envelope Properties (43BBED2A.CF5 : 15 : 11509)

Subject: Penn State Breazeale Reactor Instrumentation Event
Creation Date: 1/4/06 10:43AM
From: Fred Sears <cfsnuc@enr.psu.edu>

Created By: cfsnuc@enr.psu.edu

Recipients

nrc.gov
 owf4_po.OWFN_DO
 MMM (Marvin Mendonca)

nrc.gov
 kp1_po.KP_DO
 TFD (Thomas Dragoun)

psu.edu
 ejp CC (Eva J. Pell)

enr.psu.edu
 LBurton CC (Larry Burton)

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Priority: Standard
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Security: Standard