

BWR Sample Problem Loss of Inventory at Peach Bottom

Event Details

- Licensee in cold shutdown
- Licensee conducted an infrequently performed procedure to flush hot spots from the RHR piping.
- Procedure required the RHR system to be aligned in the LPCI mode.
- Operators made pen and ink change to the procedure to allow the evolution to be conducted in the shutdown cooling mode.
- When operators started the 3D RHR pump to flush the line, a siphon was created from the vessel through the 3B RHR pump and heat exchanger to the torus
- Operators diagnosed the event and terminated the leak path
- Level was inadvertent reduced from +200 inches to + 158" in 4.5 minutes
- 8500 gallons displaced from vessel to torus.
- Time to RHR shutoff head 3 hours

Plant Configuration

- Low Low vessel level isolation was in service and would have terminated the leak path with an additional 1" of level decrease.
- 2 SRVs were available for long term cooling and pressure control.
- At low-low low level, a train of core spray and a train of LPCI would have automatically injected into the vessel.
- The operators were able to terminate the leak path using valves other than the RHR suction valves.
- Time to RHR shutoff head was 3 hours
- Containment venting is available.
- Long term source of water is available.
- For problem estimate that containment Cooling or venting not needed for 24 hours.

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Supporting Facts for Analysis

The licensee's action on the discharge side of the pump (throttling) initially solved the flow perturbations. Once the heat-up and/or the drawing of a vacuum in the RCS negated the effects of throttling the RHR pump discharge, charging quickly returned RHR pump performance to normal.

The licensee states that the operators were seeing very early indications of problems with the RHR system, and that the problems were easily corrected. The resident agrees with the licensee's assessment that pump performance was slightly degraded.

All instrumentation was reported to be working normally, and recovery actions were easily identified and implemented by the licensee in a matter of a few minutes.

PWR Sample Problem 1

Shutdown Cooling Flow Perturbations at Wolf Creek

Initial Conditions for this Event

- The plant was in Mode 5 with the RCS level at mid-loop.
- The RCS was aligned for vacuum fill; no RCS vent was in place.
- Train "A" RHR was in service providing shutdown cooling.
- Train "B" RHR was in standby aligned for shutdown cooling.
- Secondary sides of the steam generators were filled.
- All plant equipment was available except for the non-safety related "C" normal service water pump and the non-safety related normal charging pump (NCP).
- Accumulators are isolated from the RCS by closure of their motor-operated discharge valves. Automatic safety injection signal is also disabled in this mode/configuration.
- Wolf Creek plant had shut down on 5/13/02 for retrieval of foreign objects (loose parts) from the "D" steam generator bowl.

Event

In order to accomplish object retrieval, the level in the RCS was reduced to mid-loop to allow opening of the steam generator manways. Following foreign object retrieval on 5/17/02, the steam generator manways were installed and the RCS was aligned for vacuum fill and vent.

While drawing a vacuum on the RCS, the "A" train RHR pump, which was in service for shutdown cooling, experienced flow perturbations.

RHR flow rate was reduced which initially decreased the perturbations, but as the RCS temperature increased, RHR flow perturbations were again experienced.

The "A" CCP was aligned to deliver water from the RWST and as soon as RCS loop level began to increase, the RHR flow perturbations stopped,

The licensee continued with their planned filling of the RCS.

RHR/RCS temperature did not exceed the Technical Specification limit of 140°F.

Performance Deficiency

The cause of the flow perturbation was operating the RHR pump at a flow rate greater than 2000 gpm, which is a violation of licensee procedures. The resident stated that control room operators were not aware of the caution in the procedures.