March 23, 1990 SIL No. 459S1

BYRON-JACKSON RECIRCULATION PUMP HEAT EXCHANGER LEAKAGE

Background

An increase was noted recently in the level of the closed cooling water (CCW) surge tank at Dresden Station, Unit 3, indicating possible in-leakage to the CCW. Investigations conducted by plant personnel indicated the in-leakage source was from inside the drywell. Because the recirculation pump heat exchangers are a potential source of reactor water in-leakage to the CCW inside the drywell, a heat exchanger leak was suspected.

SIL No. 459, entitled "Byron-Jackson Recirculation Pump Shaft & Cover Cracking", which GE Nuclear Energy issued on December 15, 1987, de- scribed instances of GE BWR recirculation pump shaft and cover crack- ing in Byron-Jackson pumps. Cover cracking was identified as having the potential for breaching the pump internal pressure boundary be- tween reactor coolant and the CCW, causing leakage of reactor coolant into the CCW. The purpose of this Supplement 1 to SIL No. 459 is to inform GE BWR owners of a possible occurrence of such leakage.

Discussion

At Dresden Unit 3, the following three coolant flows are used to maintain the pump seal cavity temperatures within the seal design limits.

o CCW flows through the shell side of an external tube-in-shell seal cavity heat exchanger at a rate of about 35 gallons per minute (gpm). Reactor coolant is pumped through the tube side by an auxiliary impeller within the pump.

o CCW flows into the water jacket and through drilled hole passages within the pump cover at approximately 12 gpm. The inlet and outlet

connections and the flow passages within the pump for this flow path are entirely separate from the external heat exchanger.

o Seal purge is injected into the pump from the control rod drivE (CRD) hydraulic system to maintain seal cleanliness and also to contribute to seal cooling.

Because of the concerns addressed in SIL No. 459, it was concluded that the most likely source of in-leakage of reactor water was from the drilled hole heat exchanger and not the tube and shell heat exchanger.

After the plant was shutdown, leak check measurements were made on the heat exchangers on both pumps. This was accomplished by disconnecting both sets of inlet and outlet connections to CCW on both pumps such that the piping from the heat exchangers was open to the atmosphere. The recirculation pumps then were pressurized internally by isolating the pumps with the pump suction and discharge valves and pressurizing the bowls from the CRD system via maintenance connections. Following pressurization of the pumps for several hours, a very small amount of leakage was observed at the CCW drilled hole heat exchanger outlet connection on the "B" recirculation pump. The "A" pump showed no leakage. Repeat pressurization of the "B" pump for leak quantifica- tion purposes failed to confirm the initial leakage observations.

Although cracking had been observed in other recirculation pump covers during in-service inspections at other GE BWRs, this is the first occurrence at any GE BWR of possible leakage through the pressure boundary between the reactor coolant and the CCW flow passages.

As noted in SIL No. 459, the CCW system is designed for low pressure (about 150 psig). Reactor water in-leakage has a tendency to contami- nate CCW with reactor coolant and to pressurize the low pressure sys- tem. Because both are unacceptable, Byron-Jackson had previously performed an evaluation of continued pump operation without use of the drilled hole heat exchanger under direction of the BWR Owners Group. Based on that evaluation, GE and the utility developed a 10CFR50.59 Safety Evaluation to return the "B" pump to service. An alteration was incorporated to enable continued pump operation with the possible small leak routed to the identified leakage sump.

After completing alterations to monitor, measure and collect leakage in accordance with safety evaluation results, the plant was returned to service in late February 1990 under existing Technical Specifica- tions. Since the plant restarted, pump operation under special moni- toring procedures has been fully satisfactory with leakage, if present, below the threshold of detectability.

To receive additional information on this subject or for assistance in implementing a recommendation, please contact your local GE Nuclear Energy Service Representative.

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For further information, comments, questions,
on these Web pages send an E-Mail to the Power Answer Center Administrator

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Product Reference: B33 Reactor Recirculation

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