UNIT 1 LETDOWN/NC FSL-613 ISSUE

NC flow switch NCN-FSL-613 senses low NC flow, or essentially no NC flow, through the heat exchanger and sends an isolation signal to CVCS system valve CH-523. The purpose of the signal is to isolate CH system flow upon a complete loss of NC system flow and prevent un-cooled letdown process fluid from flowing downstream of the letdown heat exchanger. The CH system components of particular concern are the CH purification ion exchangers. Three redundant non-safety related means for protection of the ion exchangers are provided:

1) by divert valve CH-520 which receives a signal from CHT-224 on high CH temperature to bypass flow around the ion exchangers.
2) CHT-224 also sends an isolation signal to the letdown back pressure control valves, CH-201P and CH-201Q, on high CH temperature when these valves are being controlled in AUTO.
3) closure of CH-523 on low/no NC flow to the letdown heat exchanger

Over the past several years, Unit 1 has experienced CVCS letdown isolation events initiated by NC flow switch NCN-FSL-613. The isolation events have occurred during the cooler months when the NC fluid temperature is low and the NC letdown heat exchanger outlet valve is controlling near its closed position. In addition, there are indications that the NCN-FSL-613 flow switch is isolating at flow rates above the required setpoint of 39 gpm. The combination of these two conditions results in inadvertent isolation of letdown flow due to the generation of the isolation signal to valve CH-523. T-Mod 2594804 was installed to address the inadvertent letdown isolation events. This T-Mod installed a "jumper" around the NC flow switch such that the isolation signal would not be sent to valve CH-523. The T-Mod recognized that two of the original three redundant means existed to isolate CH flow on high temperature via the divert signal to CH-520 and the isolation signal to CH-201P/Q. However, the T-Mod did not explicitly address the fact that CH-201P/Q must be in AUTO mode to receive the isolation signal.

During the LOOP event, the NC system pumps lost power and NC flow through the letdown heat exchanger ceased. No isolation signal was received by CH-523 due to the T-Mod installed "jumper" on the NCN-FSL-613 switch. The NQR control system for CH-201P/Q briefly lost power and then powered up again on backup power. However, the control system automatically reverts to manual control when it initially powers up from a loss of power condition. Since CH-201P/Q were operating in manual mode, not AUTO, the valves did not receive the AUTO mode only isolation interlock from CHT-224. Therefore, letdown flow was not isolated. However, valve CH-520 did receive the divert signal from CHT-224 and the hot CH flow stream was by-passed around the purification ion exchangers. Subsequent review has concluded that no significant degradation was experienced by any other CH system piping/components located downstream of the letdown heat exchanger.

Letdown did not isolate automatically in Unit 1 during the LOOP event because 1) the T-mod removed one of the 3 original means to protect the ion exchangers and 2) per design, the loss of power caused the CH-201 P/Q controller to revert to manual control. It must

be noted that the loss of power causing the CH-201 P/Q controller to revert to manual control exists with or without the T-mod on FSL-613.

The evaluation/justification for the T-mod around FSL-613 did not explicitly address or acknowledge the design of the CH-201 P/Q controller upon loss of power. It simply acknowledged that redundant means for isolation of letdown/protection of the ion exchangers continued to exist even with the removal of the FSL-613 auto closure of CH-523. All of the interlocks are non-safety related. Since the UFSAR description of these interlocks does not explicitly address how the CH-201 P/Q controller behaves in a loss of power scenario, it is not unreasonable that the T-mod evaluation did not evaluate explicitly how the two remaining means for letdown isolation/ion exchanger protection would behave under various scenarios such as a loss of power. Since all of the interlocks are non-safety related, there are several failures and scenarios that would result in a failure to automatically isolate letdown. Operators are trained during control room simulations to respond to plant events given a variety of equipment failures and scenarios. During the LOOP event, the Operators in Unit 1 correctly responded to the high temperature condition at the outlet of the letdown heat exchanger by manually isolating letdown.