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Subject: DC fire URI

An unresolved item was identified regarding the substitution of manual actions to compensate for the removal of a Thermo-Lag fire barrier.

The team reviewed a comprehensive list of design changes that resulted in removal of Thermo-Lag fire barriers, focusing on instances where manual actions were substituted in lieu of installing a fire barrier of a different type. Only one example was identified where manual actions were substituted. Design Change DCP A-050070, "Replace Existing Thermo-Lag Fire Barriers Installed in Unit 2 with Alternative Systems," Revision 0, removed Thermo-Lag 3-hour rated fire barriers from conduits and junction boxes (located in Fire Area TB-7/ Fire Zone 19-A) that contained power and control circuits associated with component cooling water supply header (motor-operated) Valve FCV-431 . Valve-431 is required for safe shutdown following a fire.

The design change stated that operator action could be taken to open Valve FCV-431 manually (using the local handwheel operator) in the event that it spuriously closed as a consequence of fire damage. The team reviewed circuits associated with this valve and determined that two hot shorts could cause the valve to close while bypassing the limit switch that would normally stop the motion of the actuator prior to motor stall. A stall event has the potential to damage a motor-operated valve to the extent that subsequent manual handwheel operation may not be possible.

The team reviewed Calculation J-042, "Motor-Operated Rotary Valve and Damper Torque Requirements and Capability," Revision 8, to identify whether Valve FCV-431 could experience a motor stall event and remain available for manual operations. The torque rating of the actuator is 250 foot-pounds, with a one-time overtorque allowable of two times this amount (500 foot-pounds) as specified by the manufacturer (Limitorque, Inc.). The calculation used a revised formula to estimate stall torque, using a pullout actuator efficiency in lieu of the stall actuator efficiency, which is normally used in stall calculations, while uprating motor torque by 20 percent. Using this formula, the stall torque for Valve FCV-431 was calculated to be 467 foot-pounds, which was within the manufacturer's limit for a one-time event. Using the standard method for calculating stall, the team determined the stall torque to be 563 foot-pounds, which is in excess of the one-time allowable. Because the outcome depended on the validity of the revised stall formula, the team requested that the license provide validation for its use.

Following the onsite inspection, several conference calls were conducted to discuss the validity of the revised stall formula. The licensee stated that it relied on two pieces of information: SEL-12, published by Limitorque, and NUREG/CR-6478. SEL-12 provided a table that showed various configurations of actuator size and gear ratio that are "inherently protected" against stall events. Valve FCV-431 was indicated by this table to be stall-protected. NUREG/CR-6478 documented results of tests conducted by the Idaho National Engineering and Environmental Laboratory (INEEL) that monitored actuator efficiencies under various service conditions.

Although SEL-12 is still endorsed by Limotorque, the team questioned its use because it was published in 1980 and did not reflect the results of numerous testing programs conducted since that time. The team also questioned whether NUREG/CR-6478, which showed pullout efficiency to bound observed measurements during stall, could be used for Valve FCV-431, since the tested valve at INEEL was a flexible-wedge gate valve whereas FCV-31 is a butterfly valve. The manner in which the valve is loaded prior to experiencing a stall is different in both cases and this difference can result in a different actuator efficiency. In response to this concern, the licensee staff agreed to analyze the loading behavior of Valve-431 during a stall

event and to make a comparison to the valve tested by INEEL. This issue is considered unresolved (50-275;323/03xx-xx) pending receipt and review of the licensee's evaluation. The team considered the risk associated with this issue to be minimal pending the licensee's review because the event would require the unlikely occurrence of two hot shorts of the correct polarity. Also, the overtorque, even if it equaled 563 foot-pounds in accordance with the standard calculation, would only have small probability of damaging the valve enough to affect manual operations.