Demonstration of Treatment of Findings in Cross-Cutting Areas

Finding #1

A self-revealing non-cited violation was identified when the 11 steam generator steam flow protection channel 1 instrument failed downscale due to an open instrument equalizing valve. The equalizing valve was left partially open at the conclusion of calibration activities contrary to procedure requirements. This finding was determined to be a non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings."

Description

On December 16, 2004, control room operators performed a control board walkdown during a reactor power increase. The operators observed that the 11 steam generator steam line flow channel 1 instrument was reading approximately 10 percent (%) while channel 2 and all other steam generator channels were reading approximately 26%. About 7 hours elapsed during the power ascension from 10% power to 26% power when the discrepant instrument was identified. The licensee initiated troubleshooting activities to resolve the discrepant instrument indication. Operators and maintenance technicians immediately placed the failed steam line flow instrument bistable in a tripped condition.

The licensee's troubleshooting identified that the instrument transmitter equalizing valve was slightly open. Further investigation determined that the transmitter was last worked on December 8, 2004, to perform a sensor calibration. The unit was in hot shutdown conditions when the transmitter was returned to service. Instrument and calibration procedure IC-SC.RCP-0028, "1FT-512 #11 Steam Generator Steam Flow Protection Channel I," provided detailed work instructions to properly return the instrument to service. The procedure also required independent verification of the closed equalizing valve.

The licensee's evaluation of this issue concluded that the transmitter equalizing valve was not properly closed on December 8, 2004. The inspectors judged that the control room operators identified the failed instrument in a timely fashion and took prompt action consistent with Technical Specification requirements.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a human performance cross-cutting aspect (personnel) because it involved a failure to follow maintenance procedure requirements.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a human performance cross-cutting aspect (work practices) because it involved a failure to follow maintenance procedure requirements.

Finding #2

A self-revealing finding was identified when tubing on a temporary test gauge ruptured from being over-pressurized and sprayed the inside of the turbine driven auxiliary feedwater pump panel with water resulting in pump unavailability. This finding involved inadequate procedural adherence and was a non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings."

Description

During performance of the turbine-driven auxiliary feedwater pump surveillance test on October 27, 2004, tubing on a temporary test gauge used to record the pump's discharge pressure ruptured from being over-pressurized and sprayed the inside of the associated local instrument panel with water. Several instruments, components, and switches used to operate the pump remotely and locally were sprayed with water. Operators tripped the turbine-driven auxiliary feedwater pump and declared the pump inoperable and unavailable. Operators removed the water from the panel and wiped down equipment within the panel. Maintenance technicians opened and inspected instrument covers. Additionally, electrical components were blown down with dry instrument air. The surveillance test was re-performed and the pump was declared operable several hours later that day.

The licensee determined that maintenance technicians installed a temporary test gauge with tubing that was not rated high enough for the parameters being tested. The licensee's procedure SH.MD-DG.ZZ-0007, "Maintenance Standards," section 5.4.8 stated that tubing should be selected that has a marked pressure and temperature rating that is at least 10 percent greater than the job requirements. The maintenance technicians selected tubing that was rated for 240 pounds per square inch guage (psig). The surveillance procedure required measuring and test equipment with a pressure range of 0 to 3000 psig. The maintenance technicians selected the incorrect rated tubing and incorrectly assumed that the "HP" stamped on the tubing meant high pressure, it did not. The licensee initiated corrective actions which involved just-in-time training to refresh maintenance technicians on the proper use, type, and fittings for tubing.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a human performance cross-cutting aspect (personnel) and involved a failure to comply with maintenance procedure requirements.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a human performance cross-cutting aspect (work practices) and involved a failure to comply with maintenance procedure requirements.

Finding #3

The inspectors identified a failure to properly translate temporary modification details into work order instructions which resulted in the installation of incorrect sealant around seven floor drain covers in the auxiliary building. This finding was of very low safety significance and determined to be a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings."

Description

On September 20, 2004, the licensee installed sealant around covers to close gaps on seven floor drains in the auxiliary building. The licensee developed temporary modification packages 04-027 and 04-028 to provide procedure and administrative controls. The seven floor drains affected were located in the inboard penetration, mechanical penetration, and electrical penetration areas. The design of the covers consisted of a steel plate that was supported by three steel tabs. This left a gap in the area where the steel plate did not contact the steel tabs.

The licensee installed covers on these seven floor drains in 1999 under design change packages 70000440 and 70000441 to prevent steam flow propagation through floor drains to mild areas of the auxiliary building from a main steam line break. The covers protected safety related systems, structures, and components in mild areas of the auxiliary building from being exposed to the harsh environment (higher temperature and humidity) associated with a main steam line break.

The inspectors performed a walkdown of the areas described in the temporary modification on November 2, 2004, to verify that the sealant was installed in accordance with the temporary modification package. The inspectors observed that Dow Corning® 732 Multi Purpose Sealant - White was installed, however, the temporary modification package required the use of Dow Corning® 732 Multi Purpose Sealant - Black. The Dow Corning® 732 Multi-Purpose Sealant is a general purpose sealant that acts as a space-filling rubber adhesive. The licensee determined that a lack of communication contributed to the incorrect sealant being placed in the work order to install the temporary modification. The temporary modification required that Dow Corning® 732 Multi-Purpose Sealant - Black be installed because it was rated for intermittent use up to 450^{o}F versus the white sealant which was rated up to 400^{o}F. However, this detail was not translated into work order instructions which were utilized during field installation. The inspectors also noted that engineers did not verify the correctness of installation as required by procedure NC.DE-AP.ZZ-0030, "Control of Temporary Modifications." The licensee initiated Condition Reports 20209660 and 20209659 to address these concerns.

On November 11, 2004, the licensee removed the sealant around the floor drains and installed the Dow Corning® 732 Multi Purpose Sealant - Black as stated in the temporary modification packages.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a human performance cross-cutting aspect (personnel) because the temporary modification details were not properly translated into work order instructions.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a human performance cross-cutting aspect (resources) because the work package instructions were inadequate.

Finding #4

A self-revealing finding was identified when the 15 containment fan coil unit failed to start in high speed on May 24, 2005. The charging spring toggle switches on the high and low speed 15 containment fan coil unit breakers were mis-positioned during a surveillance test on May 18, 2005. The configuration control error rendered the containment fan coil unit inoperable for 160 hours. The finding was a non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings."

Description

On May 24, 2005, at 11:47 pm, the 15 containment fan coil unit failed to start in high speed when control room operators shifted the unit from low speed to high speed. Containment fan coil units are designed to operate in low fan speed for accident mitigation. High speed operation is used for containment cooling during normal plant operation. The licensee discovered that the high and low speed breaker charging spring motor toggle switches were both in the 'off' position. Operators turned the switches to the 'on' position, and the charging springs charged. Operators started the 15 containment fan coil unit at 12:07 am on May 25, 2005, and declared the 15 containment fan coil unit operable.

The licensee's corrective action evaluation concluded that the most likely cause of the configuration error was that the charging spring toggle switches were erroneously placed in the off position during a surveillance activity. Specifically, on May 18, 2005, personnel performed OP-ST.SW-0016, "Inservice Testing Service Water Accumulator Discharge Valves," which required the 15 containment fan coil unit low speed and high speed breaker control power to be disabled during the test.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a human performance cross-cutting aspect (personnel) because it involved a failure to follow procedure.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a human performance cross-cutting aspect (work practices) because it involved a failure to follow procedure.

Finding #5

A self-revealing finding was identified when the reactor automatically tripped on September 9, 2004, in response to a generator protection trip. The licensee failed to incorporate vendor recommended daily and weekly inspections of the exciter brushes. A brush failure resulted in a generator protection trip. The finding was not a violation of NRC requirements, in that the performance deficiency occurred on a non-safety related system.

Description

On September 9, 2004, at 1:06 a.m., the reactor tripped as designed from an unplanned turbine trip. All control rods fully inserted and all safety related systems were available and functioned as designed. The turbine trip was due to a generator differential and loss of field trip signals.

In followup troubleshooting efforts, engineers identified that an Alterrex exciter's brush assembly had failed. The engineers determined that the brushes were severely worn and degraded to a point that severe arcing occurred. Arching caused a gap between the brush and collector ring which resulted in a loss of generator field.

The licensee initiated a root cause evaluation to investigate the root cause and contributing causes, and to develop subsequent corrective actions. Two root causes were determined: vendor recommended daily operator inspections and weekly maintenance inspections were not implemented when the generator was installed in 1986, and lessons learned from industry operating experience were not applied. The root cause evaluation further stated that flashover is a progressive condition and it is necessary to recognize and heed the early warning signals during routine maintenance to prevent serious trouble.

Cross-Cutting Aspects of the Finding - Existing Process

No cross-cutting aspect was identified.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a problem identification and resolution cross-cutting aspect (operating experience) because lessons learned from industry operating experience were not incorporated into station processes and procedures.

Finding #6

The inspectors identified that the reactor sump room door was contrary to plant design. The configuration discrepancy reduced the available margin to identify and isolate a postulated service water leak from a containment fan coil unit prior to flooding safety-related equipment during loss-of-coolant accident conditions. This finding was of very low safety significance (Green) and determined to be a non-cited violation of 10 CFR 50, Appendix B, Criterion III, "Design Control."

Description

On July 8, 2004, the NRC opened an unresolved item to review the licensee's revised containment flooding calculation and the simulator sump level response. The inspectors questioned a plateau in containment level response during a loss of coolant accident as modeled for the simulator. Initially the inspectors learned that the plateau occurred when containment water level would reach the door threshold to the reactor sump room. Water was assumed to flow unimpeded to lower levels over the door threshold and through a wire mesh door. However, the licensee discovered through photographs a solid metal door to the reactor sump room. The solid plate door was not consistent with design drawings.

The simulator modeling was based on the facility's containment flooding calculation. The calculation assumed containment annulus level would stabilize at an 81' 9" elevation while additional water spilled freely through a wire mesh door to fill up the reactor sump room and reactor coolant drain tank pits. The calculation stated that containment flooding up to 84 feet could be tolerated without impacting safety-related equipment. The calculation also determined that the maximum expected level was 83 feet 6 inches. The calculation further stated that a level of 83 feet 6 inches provided sufficient time for operators to identify and isolate a postulated 100 gallons per minute (gpm) service water leak from a containment fan cooler unit before reaching 84 feet.

The licensee issued Condition Report 20181019 and Work Order 70037479 to evaluate the condition. Licensee engineers issued a revised calculation on October 7, 2004. This calculation evaluated two alternate flow paths between the containment annulus and reactor sump room that were not credited in the original. Specifically, the new calculation determined expected flow rates through two floor drains that connected the reactor coolant drain tank pit with the reactor sump room and the expected flow rate through a four by six inch hole cut into the bottom right corner of the solid metal door. The new calculation concluded that the maximum flood level was still below 84 feet. The final calculated containment flood level was 83 feet 10.73 inches. 1.27 inches of margin was maintained for operators to identify and isolate the postulated service water leak from a containment fan cooler unit.

Cross-Cutting Aspects of the Finding - Existing Process

No cross-cutting aspect was identified.

Cross-Cutting Aspects of the Finding - Proposed Process

No cross-cutting aspect was identified.

Finding #7

A finding of low to moderate safety significance was identified where engineering staff did not properly evaluate and correct a degraded level control valve for the 'A' moisture separator drain tank, as required by station procedures. In addition, engineers did not properly consider a similar occurrence from 1988. The level control valve failed 25 days prior to the event and caused the moisture separator drain system to operate in a condition outside its design. As a result, an 8-inch pipe in that system failed and caused a transient initiating event on October 10, 2004.

Description

On September 16, 2004, the licensee initiated Condition Report 20203784, which identified that the moisture separator low level alarm was received and the 'A' moisture separator dump valve, LV-1039A, was noted on computer display system to be about 10% open while the associated valve controller was receiving an air signal to fully close the valve. The inspectors concluded that this was the point in time where the valve had been opened for sufficient duration to completely drain the 'A' moisture separator drain tank (valve open and moisture separator low level alarm). A condenser area entry was made on September 16 to investigate fittings associated with the air supply line. Engineering and operations personnel discussed this issue, and engineering responded formally on September 20, stating that there was not an immediate safety concern.

However, an operator, not satisfied with the September 20 response, initiated another condition report (20204256) that same day, stating that the prior condition report addressed only flow accelerated corrosion concerns. Specifically, it did not address potential impact to the condenser/baffle plate, and the potential impact to the condenser penetration which had cracked on an earlier occasion (1988) when this same dump valve had failed open for an extended period of time (resulting in elevated offgas flow due to increased in-leakage through the crack at the penetration to the condenser). Again, a formal engineering response, completed on September 22, did not address the entire concern. Only the first issue of potential internal condenser damage was addressed, and the response re-stated the original flow accelerated corrosion response.

The responses to both condition reports stated that the affected valve and associated piping would be inspected during the upcoming refueling outage, scheduled to begin around the end of October 2004.

Neither evaluation considered that two-phase flow could be present from the moisture separator drain tank (operating pressure - about 160 psig) to the main condenser (operating pressure - vacuum conditions). The total length of piping from the moisture separator drain tank to the condenser is about 60 linear feet. This piping was not designed for the dynamic loading that would accompany two-phase flow. The disconnected hanger (H25), while likewise unknown at the time, was not available to mitigate the dynamic loading of the lines. The inspectors concluded that engineering's evaluations associated with the two condition reports were inadequate because the associated MWe reduction due to the leakage, the loss of water level in moisture separator 'A' and the difference in operating pressures in the moisture separator

drain tank and the main condenser, should have led to the recognition that there was two-phase flow in the line upstream of LV-1039A.

After about 25 days (September 16 to October 10, 2004) of operation beyond the design loading capacity of the moisture separator drain tank piping, the 8-inch pipe failed near the condenser penetration, resulting in a steam leak, manual reactor scram, and loss of condenser vacuum.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a problem identification and resolution cross cutting aspect (evaluation) because the licensee failed to perform an adequate evaluation to correct the condition or cause of the deficiency as required by licensee's corrective action program.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a problem identification and resolution cross cutting aspect (corrective action program) because the licensee failed to perform an adequate evaluation to correct the condition or cause of the deficiency as required by licensee's corrective action program.

Finding #8

The inspectors identified a non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," because the licensee did not identify a condition adverse to quality in August 2004, related to open torque switch bypass settings for a core spray injection valve that did not stroke open during in-service testing and, as a result, did not establish appropriate corrective action.

Description

On August 21, 2004, operators initiated Condition Report 20201072 to document that the train A core spray outboard injection valve (MOV BE-HV-F004A) did not stroke open during an in-service test. Operators determined that the valve remained operable because the valve is normally open and remains open during an accident, the valve has no safety function to close, and the valve stroked open successfully in two subsequent attempts. Engineering's assessment of the valve response was a loose wire or dirty contact and initiated Work Order 60047832 to inspect the limit switch compartment in November 2005. On February 1, 2005, operators initiated Condition Report 20222530 to document that the A core spray outboard injection valve again failed to stroke open during a in-service test. Operators declared the valve inoperable and maintenance worked the valve.

The inspectors determined that, in response to Condition Report 20201072, engineering incorrectly evaluated the open torque switch bypass (OTSB) setting for the valve and as a result did not identify an incorrect setting and thereby did not establish the appropriate corrective action to ensure that the valve would stroke open when demanded. The valve has both an automatic and manual OTSB bypass circuit that bypasses the OTSB if needed during an accident. The inspectors concluded that since 1993 the OTSB setting for this valve had been set at 6 percent (%) and this setting was outside of the range (15% - 50%) permitted by procedure. In response to Condition Report 20201072, engineering reviewed the diagnostic VOTES test performed in 2002 for the valve and did not recognize that the documented OTSB setting (12% of the open stroke) was outside of the range specified by procedure. As a result, engineering's assessment that the valve response was due to a loose wire or dirty contact was incorrect and the corrective action to inspect the limit switch compartment in November 2005 was insufficient to correct the OTSB setting. In response to Condition Report 20222530, engineering recognized that not only was the documented OTSB setting in the VOTES test performed in 2002 out of specification, it was also documented in error and was actually set at 6% of open stroke. The VOTES testing in 1993 showed the OTSB setting at 6% of open stroke. As a result, the licensee took corrective action and adjusted the setting to 24% of the open stroke. The inspectors noted that this repeat failure resulted in approximately 24 hours of additional unplanned unavailability of the A core spray subsystem.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a problem identification and resolution cross cutting aspect (evaluation) because the licensee did not correctly evaluate the open torque switch bypass setting for the valve.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a problem identification and resolution cross cutting aspect (corrective action program) because the licensee did not correctly evaluate the open torque switch bypass setting for the valve.

Finding #9

The inspectors identified that the licensee did not correct a degraded condition associated with the control rod drive pump room floor access hatches and floor drains after the condition resulted in water leaking onto the 'B' and 'D' core spray pumps in December 2004. This finding was determined to be a non-cited violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action."

Description

On December 22, 2004, licensee personnel noted that the control rod drive pump room floor drains were clogged during a planned system draining evolution. During the evolution water overflowed onto the control rod drive pump room floor and past the unsealed gaps of the control rod drive pump room floor access hatches located above the core spray pump room, instead of draining to the reactor building sump. The water leaked onto the 'B' and 'D' core spray pump motors. At the time of the evolution, the plant was shutdown and the core spray pumps were not required to be operable by Technical Specifications. Maintenance personnel immediately absorbed the water from the pump motors and performed motor insulation resistance checks to confirm that the pump motors were not damaged. The licensee entered the condition into the corrective action program as Condition Report 20216883.

On February 16, 2005, while the plant was operating at power, the inspectors reviewed the licensee's corrective actions for Condition Report 20216883, which listed a corrective action to clear the control rod drive pump room floor drains. The action was assigned to the maintenance department to coordinate a contractor to clear the drains. The inspectors identified that the task was not assigned or scheduled. In addition, the inspectors identified that the floor access hatches to the core spray pump rooms were not sealed or assigned to be sealed to protect the core spray pumps from an internal flood until questioned by the inspectors. The licensee entered this condition into the corrective action program in Condition Report 20224587. The floor access hatches were repaired on February 24, 2005, when maintenance personnel placed a sealant material around the openings between the floor and floor access hatch.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a problem identification and resolution cross cutting aspect (evaluation) because the licensee did not properly evaluate and recognize the condition as a potential internal flooding hazard which could impact safety related equipment.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a problem identification and resolution cross cutting aspect (corrective action program) because the licensee did not properly evaluate and recognize the condition as a potential internal flooding hazard which could impact safety related equipment.

Finding #10

A self-revealing finding was identified regarding inadequate procedure guidance when the B service water pump packing failed on July 14, 2004. The finding was determined to be a non-cited violation of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings."

Description

On July 14, 2004, an equipment operator observed excessive packing leakage on the B service water pump. Licensee personnel determined that the nuts on the pump packing gland had backed off and disengaged on three of the four studs. The nut remained threaded on the fourth stud; however, the stud had backed out of the pump casing. As a result, the gland rotated approximately two inches from its bolted position and caused excessive packing leakage.

Operations personnel removed the B service water pump from service due to the high packing leakage. The C service water pump was out of service at the time for corrective maintenance to its associated strainer. Operations entered the applicable Technical Specification for two inoperable service water pumps. Additionally, operators decreased reactor power to 70 percent in accordance with procedures to maintain the non-safety related turbine auxiliary cooling system heat load supply temperatures within limits. Also, the licensee formed an operational challenge response team to investigate and identify immediate corrective actions.

The licensee corrected the problem on July 15, 2004, and restored the B service water pump to service and subsequently completed an apparent cause evaluation. The evaluation identified that guidance contained in the maintenance procedure was inadequate because the procedure did not include vendor manual direction to verify the required packing height and ensure the gland follower could be inserted between 1/8 and 3/16 inches into the stuffing box.

The apparent cause evaluation identified two contributing causes. First, in December 2003 the licensee installed oversized packing in the B service water pump that caused the stackup of the packing rings in the pump gland to be greater than specified in the pump bill of material and prevented full thread engagement on the gland follower studs. Second, in June 2004 the inspectors identified and informed the system engineer that two nuts on the B service water pump packing gland were not fully threaded on the gland studs as required by the licensee's bolting and torquing procedure, but the condition was not entered into the corrective action process for evaluation. The cause evaluation also determined that prior to June 2004, the licensee had two opportunities to self-identify the degraded condition of the B service water pump. In May 2004, maintenance personnel experienced problems installing packing in the A service water pump and the licensee determined that the packing was too thick, but failed to identify the same problem on the B service water pump during its extent of condition review. On May 14, 2004, the licensee again failed to identify the degraded condition when maintenance personnel reinstalled oversized packing in the B service water pump following maintenance.

The inspectors concluded that the licensee identified the likely causal factors and corrective actions were appropriately broad to address the causal factors. The B service water pump was re-packed with normal sized packing. The licensee also tracked corrective actions to revise

maintenance procedures with more detailed guidance and re-emphasize through training to maintenance personnel the thread engagement requirements.

Cross-Cutting Aspects of the Finding - Existing Process

The performance deficiency had a problem identification and resolution cross cutting aspect (evaluation) because the licensee did not properly evaluate an identified problem and initiate appropriate corrective action which allowed a subsequent failure of the B service water pump.

Cross-Cutting Aspects of the Finding - Proposed Process

The performance deficiency had a problem identification and resolution cross cutting aspect (corrective action program) because the licensee did not properly evaluate an identified problem and initiate appropriate corrective action which allowed a subsequent failure of the B service water pump. In addition, the performance deficiency had a human performance cross-cutting aspect (resources) because the maintenance procedure instructions were inadequate.