BACKGROUND:

Adequate RCP seal cooling can be achieved by maintaining continuous RCP seal injection or maintaining continuous CCW cooling to the RCP thermal barrier heat exchangers. During normal plant operation, both systems would usually be operating. North Anna's strategy for achieving a safe shutdown of the reactor during a fire stated that the CCW system was only required to reach and maintain cold shutdown.

The team noted that the RCP thermal barrier heart exchanger cooling return lines combine into a common header before exiting containment. This header has two air-operated, containment isolation valves (AOVs) in series, 1-CC-TT-140A and 1-CC-TT-140B (one inside containment, the other outside). Both AOVs fail closed on a loss of control power. The team confirmed that the AOV control cables passed through ESGR No. 1, were not protected from fire, and had no contingency actions defined to prevent or respond to a spurious valve operation. Also, these cables were powered from cabinets located in ESGR No. 1 (UPS cabinet 1A1 and 1B2). A severe fire in ESGR No. 1 could cause either isolation valve to fail closed which would result in a long term loss of RCP thermal barrier cooling. Thus, adequate RCP seal cooling cannot be assured using thermal barrier heat exchanger cooling.

Recognizing the above issue, North Anna's SSA instead relied upon supplying continuous, uninterrupted RCP seal injection flow to assure adequate seal package cooling. The Unit 1 charging system, through an existing cross-connect, is utilized in the licensee's SSA and procedures to provide charging flow and seal injection if the Unit 2 charging system were rendered inoperable. However the team determined that for certain fire scenarios in the Unit 2 Emergency Switchgear Room, RCP seal injection will be interrupted for a significant period of time (30 minutes). The fire contingency action procedure for fire in this area, 2-FCA-2, directs the operator to initially isolate the RCP seal injection by opening breakers in the Unit 2 Cable Vault and Tunnel (CVT). Consequently, a finding was identified in that for a significant fire in the Unit 2 Emergency Switchgear Room, the CO_2 gaseous fire protection system actuation devices and controls located in the room could inadvertently actuate to discharge gaseous CO_2 into the Unit 2 CVT area due a fire-induced electrical hot short circuit condition. This inadvertent release could inhibit station operators assigned to perform the isolation , thus increasing the seal injection interruption duration which could have significant impact on the RCP seal integrity. The fire contingency action procedure does not identify the availability of nor instructions to don self-contained breathing apparatuses.

Industry issued guidance, (Westinghouse Emergency Response Guideline (ERG) Direct Work Request No. DW-94-011, dated December 12, 1996), determined that reestablishing seal injection or restoring CCW to the thermal barrier heat exchangers would not be appropriate if all seal cooling had been lost long enough that the maximum RCP seal parameters identified in the RCP Vendor Manual were exceeded. Per this guidance, this was to prevent unintended consequences that could result in additional pump damage or failure of plant safety systems [specifically CCW].

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