Entergy

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Director
Nuclear Assessment

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ENGC Ltr. 2.00.053

Docket No. 50-293
License No. DPR-35

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Correction of Information on Breaker Coordination Submitted in Pilgrim Station Letter 2.90.033

Dear Sir:

During the recent design basis review of DC control power, historical regulatory correspondence was reviewed. It was discovered that Pilgrim Station letter 2.90.033 contained incorrect statements, regarding breaker coordination, made in response to a request for additional information (RAI) contained in NRC letter 1.89.394. This request was the result of a potential concern at other boiling water reactor plants that used a swing bus to provide power to the emergency core cooling systems. The specific concern related to the propagation of an electrical fault that could cause failure of diverse core cooling systems and thus not provide adequate core cooling.

Attachment 1 provides a discussion of the Pilgrim Station response to NRC letter 1.89.394 and identifies the incorrect statements. The review concluded that while statements contained in the Pilgrim Station response concerning breaker coordination were inaccurate and complete coordination is not provided in the design, a fault on a feeder breaker at panel D6 would not impact other core cooling systems. Pilgrim's specific plant design prevents the loss of diverse systems. Therefore, the conclusion that a single failure of DC control power would not cause the loss of diverse cooling systems remains correct.

Other statements in the RAI response were reviewed and were determined to be accurate.

Please feel free to contact me if you have any questions regarding this subject.

Sincerely,

J. F. Alexander

JRH/
Attachment

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cc:

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In 1987, a DC power supply failure occurred at Fermi 2 which caused a loss of power to the low pressure coolant injection (LPCI) swing bus. This condition potentially existed in swing bus designs used at several boiling water reactors (BWRs). This design weakness could permit a single failure to cause the loss of a train of core spray and low pressure coolant injection (LPCI), thus providing potentially inadequate core cooling. In August 1988, the NRC issued Information Notice No. 88-55, "POTENTIAL PROBLEMS CAUSED BY SINGLE FAILURE OF AN ENGINEERED SAFETY FEATURE SWING BUS," describing a condition identified at HB Robinson Unit 2 where a single failure could cause the failure of two of three safety injection pumps.

In 1989, Pilgrim Station received a request for additional information (RAI), NRC letter 1.89.394, concerning the LPCI swing bus design. Pilgrim Station was requested to demonstrate how the LPCI swing bus design met the following positions imposed by the NRC staff:

A) "To confine single failures within the swing bus, only loads associated with LPCI functions, i.e., LPCI valve motors may be connected to the swing bus.

B) To reduce probability of propagating electrical faults between divisions, the bus transfer scheme (circuitry) must meet the applicable portions of IEEE Standard 279, such as the single failure criterion, testability, and quality of components.

C) To lessen probability of propagating faults into non-LPCI portions of the electrical division, proper coordination of circuit protective devices must be provided. This requires that the design provide both an adequate number of circuit breakers and proper breaker coordination."

In addition, the NRC requested that Pilgrim Station, "Identify any single failure which could disable both an emergency diesel generator and the DC swing bus leaving one core spray to perform ECCS function during an accident."

Pilgrim Station provided a detailed response in letter 2.90.033, dated March 2, 1990, documenting how the LPCI design met the positions listed above. This response correctly concluded that due to the Pilgrim specific differences in the loads on the swing bus, the inadequate core cooling concerns identified at other BWRs were not applicable to Pilgrim Station. "Since no loads associated with the core spray system are connected to the 480V AC swing bus B6, or the 125V DC swing Bus D6, loss of B6 or D6 would not cause the loss of core spray in any train (division)." This letter was used as the basis for the NRC concluding that the Pilgrim Station design was acceptable.

The Pilgrim Station letter (2.90.033) accurately described the configuration at Pilgrim Station with the exception of statements regarding breaker coordination associated with bus D6. The statements of concern are provided below:

"To lessen the probability of propagating faults on bus D6 into non-LPCI portions of the electrical division, circuit breakers with proper coordination are provided as described below. Also, as described earlier in this attachment, although loads other than those associated with LPCI are connected to the 125V DC distribution panel C (swing bus D6), the following design provisions would confine single failures within D6 and within the LPCI system:

- 125 V DC supply breaker 72-164 and alternate supply breaker 72-174, feeding bus D6 from 125V DC distribution panel A (bus D16) and panel B (bus D17) respectively, are coordinated with the feeder breakers on D6. Thus a fault on a feeder breaker will trip that breaker before any of the supply breakers. This confines a fault on loads fed from D6 within the feeder breaker for that load and therefore within D6."

The statements regarding breaker coordination, while not impacting the overall conclusions, are inaccurate. The supply breakers, 72-164 and 72-174 are thermal magnetic breakers. The feeder breakers at panel D6 are both magnetic only and thermal magnetic type breakers. With this type of breaker configuration, complete coordination cannot be achieved. When an overload or low current fault condition occurs on a magnetic only feeder breaker, the thermal portion of the thermal magnetic supply breaker will operate to clear the fault well before the fault is high enough to operate the magnetic only type breaker. Another coordination issue occurs in the high fault current region. When a fault occurs in the high current region, it is uncertain whether the feeder breaker will clear the fault before the supply breaker. In both instances, a fault on a feeder breaker could potentially migrate beyond the feeder breaker, however the supply breaker would trip and contain the fault within the boundaries of D6. Since D6 does not power core spray, both trains of core spray remain available. Under this faulted condition, Pilgrim Station would continue to meet the design basis requirements of 10 CFR 50.46.

A weakness in the original design concerning breaker coordination had previously been identified. A plant design change (PDC 86-17) replaced thermal only breakers (72-164 and 72-174) with thermal magnetic breakers. This modification improved coordination over the original breaker configuration. However, a region still existed where there was an overlap between the feeder breaker and the supply breaker. Breakers 72-164 and 72-174 were again replaced during the 1999 refueling outage (RFO 12) with a different type of thermal magnetic breaker. While some improvement occurred in the coordination between the feeder breakers and the supply breakers, complete coordination could not be achieved. However, all single failures associated with panel D6 circuits will be limited to panel D6.

A review of Pilgrim Station letter 2.90.033 was performed and it was found that all other statements were accurately presented.