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ILLINOIS POWER

U-602669
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8E.100a

November 25, 1996

Docket No. 50-461

10CFR50.90

Document Control Desk
Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Response to Request for Additional Information Related to Proposed Technical Specification Changes on Degraded Voltage Instrumentation and Other Related Technical Specification Changes (LS-94-013)

Dear Madam or Sir:

By letter dated February 22, 1996 (letter number U-602554), Illinois Power (IP) Company proposed an amendment to the Clinton Power Station Technical Specifications (TS) to revise the setpoint for the 4.16 kV safety bus degraded voltage relays, and to revise or delete other Loss of Power Instrumentation TS requirements, due to planned modifications to replace the degraded voltage relays at CPS. For related reasons, IP also proposed to change the minimum required diesel generator voltage specified in certain diesel generator surveillance requirements within the TS. Upon initial review of IP's submittal, the NRC issued a Request for Additional Information (RAI), to which IP responded via IP letter U-602613 dated July 24, 1996.

Following discussion with the NRC subsequent to IP's response to the RAI, IP determined that the proposed amendment should be revised. Consequently, by letter dated October 4, 1996 (letter number U-602635), IP submitted a revision to the proposed amendment. Following discussion with the NRC staff (Mssrs. Pickett and Lazevnick) during the NRC's review of IP's proposed TS change (as revised by IP's October 4, 1996 letter), IP further revised the proposed amendment. IP changed the proposed amendment to revise Table 3.3.8.1-1, "Loss of Power Instrumentation," by adding the Function, "Degraded Voltage - 4.16 kV basis" and "Degraded Voltage Dropout - 4.16 kV basis," re-numbering the items in the table, and revising the associated notes.

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The NRC sent IP an additional RAI by letter dated November 20, 1996. The RAI contained two questions. IP's response is provided in the attachment to this letter.

As noted in IP's February 22, 1996 submittal, the implementation schedule for the degraded voltage relay modifications calls for installing new relays for the Division 2 4.16 kV safety bus during the current outage (RF-6) at CPS. Implementation of the modifications is a safety enhancement that is part of corrective action committed to the NRC for Licensee Event Report (LER) 94-005. IP is therefore requesting that the application for amendment, as supported by this letter, continue to be reviewed on a schedule sufficient to support planned work activities currently scheduled to begin December 4, 1996.

Sincerely yours,

Paul J. Telthorst
Director-Licensing

AJP/csm

Attachment

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

By letter dated November 20, 1996, the NRC requested additional information related to Illinois Power's (IP's) submitted proposed Technical Specification (TS) amendment within IP letter dated February 22, 1996 (U-602554), as modified by IP letters dated October 4, 1996 (U-602635) and November 19, 1996 (U-602657). IP proposed to revise the TS to revise the setpoint of the degraded voltage protection, and modify or delete other Loss of Power Instrumentation TS requirements. Below please find the questions from the attachment to the NRC November 20 letter and then the response to question 1 and the response to question 2.

Questions

1. In Attachment 7 to Illinois Power Company (IP) letter dated October 4, 1996, a Sargent and Lundy letter is furnished that provides information on a comparison of some analytical models to data provided by IP. Are these the same analytical models used in the recent revision of Clinton Power Station calculation 19-AQ-02? The staff notes that the Sargent and Lundy letter is dated June 23, 1986; whereas, Clinton LER 94-005-00 indicates that IP developed a new LOCA block-start voltage model and transient calculation in 1991. Please clarify.

2. Discuss the validation of the model(s) used in the most recent analysis of equipment operation and electrical system voltages for the LOCA block start scenario on the offsite power system. The discussion should demonstrate that the model provides a true and accurate representation of the system and equipment performance during the scenario, including but not necessarily limited to:

   - Multiple simultaneous and/or sequential motor starts of various size motors with differing acceleration rates, electrical characteristics, and mechanical characteristics at all system voltage levels.

   - Motors that are in a stalled condition for some period of time during scenario analyzed.

   - Low voltage conditions seen during the scenario analyzed.

Response to Question 1

The new model uses the same analytical techniques and assumptions as the calculations performed in 1986. The difference is that we have now expanded the number of buses analyzed and have included additional data specific to our equipment. As described in LER 94-005, "the calculations prepared in 1984 to establish the second-level undervoltage relay setpoint were performed using the Sargent and Lundy Auxiliary Block mainframe

computer program. This program was limited by the number of buses it could model. The model only evaluated the voltage down to the 480 VAC substations. From the substation down to the 120 VAC level, a voltage drop was approximated using a generalized hand calculation. The acceptable voltage at the 120 VAC level was established through the analysis of a sample of circuit types. The loads were generally classified as continuously running motors over 50 horsepower and other large loads. The analysis did not evaluate the LOCA block-start transient in detail. In addition, the 1984 model did not consider the influence of motor-operated valves loads nor did it evaluate in detail the voltage at the end device."

During pre-operational testing, bus voltages were recorded at steady-state conditions and during starting of a large Class 1E motor and a non-Class 1E motor as described in NRC Branch Technical Position (BTP) PSB-1. The referenced Sargent and Lundy letter provides the evidence that the Auxiliary Block computer program used conservative analytical techniques and assumptions. The preoperational testing indicated that the voltage analysis using Auxiliary Block analytical techniques with the specific test plant loading resulted in a conservative representation of the bus voltages down to the 480 VAC level and that voltage calculations for the most limiting 120 VAC buses were also conservative.

The "new LOCA block-start voltage model and transient calculation" developed in 1991 as described in LER 94-005 uses the same Auxiliary Block analytical techniques and assumptions as the 1986 analysis. However, the modeling of 480 VAC buses and buses lower than 480 VAC has been expanded. The data that was used to represent the more accurately defined loads was based on actual plant data and vendor data, including actual cable lengths, cable impedances and detailed motor starting and running impedances. The impedances used for cables for individual loads are based on actual cable lengths. The cable lengths are maintained as part of a design basis data file under IP's software control program and are based on field collected data during construction of the plant. The cable impedances are based on actual manufacturer's data.

Rather than modeling these loads in a grouped manner, loads have been separated. Processing of the identified data changes to the computer model was performed under the strict controls of IP's software control program. The bus connection assumptions and calculational method, included in the model of the original Auxiliary Block computer program have not been changed by IP Calculation 19-AQ-02. The integrity of the model has been maintained as validated through verification and validation programs required by the software control program of IP and IP's contractors. As a result of adequate software controls, IP has concluded that the validation by the testing performed in 1986 is still applicable.

Data used for motor starting impedances was conservatively determined. For large motors, the data used was based on actual vendor data. For smaller motors, information based on vendor or industry NEMA standards were used. This NEMA standard data envelopes the expected performance of the smaller motors and is therefore adequately conservative for use in the calculation. For MOVs, the assumed locked rotor and running currents were based on motor-specific data used in the GL 89-10 program for the valves and was based on extensive MOV motor testing.

Calculation 19-AQ-02 utilizes a method that analyzes the LOCA transient in a piece-wise linear fashion with several points calculated from t=0 seconds through t=13 seconds. These intervals are those described in section 6 (starting on page 15) of Calculation 19-AQ-02. The load for each interval is calculated based on which motors are starting or running. This conservative voltage calculated for the start of each time interval is assumed to be then maintained throughout the entire time interval. The voltage changes between each interval are the result of motor loads shifting from locked rotor to running as they come up to speed. This piece-wise time interval method is continued until the transient is no longer the dominant influence and steady-state conditions are present.

The total time for a motor to come up to speed and the electrical load to shift from locked rotor to running was determined by assuming that the voltage calculated for the start of the time interval continued to exist for the entire time interval. The motor was then evaluated to determine if the motor had reached running speed. If the motor could be shown to have reached running speed by the end of the interval, its load was shifted from locked rotor to running. If the motor had not reached running speed during the interval it was considered as a locked rotor load for the next interval. The use of locked rotor current for the entire interval results in a step voltage as motors shift from drawing locked rotor current to running current. This approach is conservative.

MOVs are analyzed from two viewpoints, the voltage analysis and the required torque (or thrust) analysis. Both of these use conservative analysis techniques. However, these conditions can not occur simultaneously. Thus, this approach is conservative.

The voltage analysis conservatively calculates the voltage drop assuming the MOVs are drawing locked rotor current for the entire voltage transient. In other words, the MOVs are assumed to be at locked rotor current for the time from t=0 through t=13 seconds. This assumption assures that the node voltages are calculated in a conservative manner.

Similar conservative assumptions are made within torque (or thrust) analysis calculations for MOVs. The MOVs are divided into two groups; those which go from open to closed and those that go from closed to open. The voltage used in the GL 89-10 calculations to establish the available MOV motor torque is the steady state voltage at t=13 seconds.

The MOVs that go from open to closed start from an unloaded condition and will actually be drawing significantly less than rated load current during the voltage transient (even under reduced voltage conditions). The MOVs that go from closed to open could be operating at locked rotor for the entire voltage transient. The MOV thrust calculations show that there is margin between the calculated thrust required and the thrust that can be developed by the MOV motor at t=13 seconds. This is true even after taking reduced motor capability into consideration due to the locked rotor heating that would occur during the voltage transient. In addition, there is even more margin between the heat de-rated MOV motor torque and the torque required by the MOVs as found during MOV thrust testing. Therefore, both the voltage transient and the MOV thrust analysis is considered conservative.

Voltage profiles were used to determine the heating of protective elements and for determining whether these protective elements may trip. The voltages assumed were the voltages determined for the start of the time intervals. Use of these voltages is appropriate as there is a wide margin before any protective action might occur. An exception to this general statement is documented within IP Calculation 19-AQ-02 for MOV 1E22-F004, as noted within IP letter U-602635 dated October 4, 1996 on page 6 of Attachment 2. As discussed in IP's October 4, 1996, letter adequate margin exists to preclude tripping of MOV 1E22-F004 under a LOCA block start scenario.

Response to Question 2

The computer model used in the most recent LOCA block start analysis is not a dynamic model, but a static computer model used in a piece-wise fashion as described in detail within the response to question 1. The response to question 2 is contained within the description of how the model was applied to the transient case particularly the paragraph above which begins with the sentence "Calculation 19-AQ-02 utilizes a method that analyzes the LOCA transient in a piece-wise linear fashion with several points calculated from t=0 seconds through t=13 seconds." This paragraph as well as other discussion within the response above then addresses question 2.