UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 70 TO FACILITY OPERATING LICENSE NO. DPR-50

METROPOLITAN EDISON COMPANY
JERSEY CENTRAL POWER AND LIGHT COMPANY
PENNSYLVANIA ELECTRIC COMPANY

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-289

Introduction

By letters dated July 22, 1977 (GQL 0997), August 19, 1977 (GQL 1145), May 15, 1980 (TLL 224), and November 7, 1980 (TLL 543) Metropolitan Edison Company (Met Ed) requested an amendment to Appendix A of Facility Operating License No. DPR-50 for the Three Mile Island Nuclear Station, Unit No. 1 (TMI-1). This amendment is the result of Met Ed's review and modifications to the onsite emergency power systems associated with furnishing power to safety related equipment at TMI-1. The review by Met Ed is in response to our letters dated June 3, 1977 and August 8, 1979 addressing our concerns regarding the susceptability of safety related equipment to sustain: (1) the degraded voltages from offsite power sources, (2) the interactions between offsite and onsite emergency power systems and (3) the effects of the adequacy of the station electrical distribution systems to furnish the required emergency power during accident conditions. The amendment assures that the undervoltage relays are operable to adequately protect the safety related electrical equipment from loss capability as a result of sustained degraded voltage from the offsite electrical grid system and during transfers from offsite to onsite power source.

Discussion and Evaluation

By letter dated June 3, 1977 we requested that Met Ed propose plant modifications to meet the staff's position for the protecting safety related electrical equipment from degraded voltage due to offsite grid voltage fluctuation and interaction of the offsite and onsite emergency power systems. In addition, we requested Met Ed to propose changes to Appendix A of the license to assure the undervoltage devices will protect the electrical safety equipment during power operation.

Related to the problem of protecting safety related electrical equipment, we requested Met Ed by letter dated August 8, 1979 to factor into the plant modifications and proposed changes to Appendix A, the results of an analysis determing the adequacy of the electrical distribution system of TMI-1. The analysis is to determine that: (1) The capacity and capability of the offsite power system and the onsite distribution system is adequate to automatically start as well as operate all required safety loads within their required voltage ratings in the event of an anticipated transient, or an accident (such as LOCA) without manual shedding of any electric loads, (2) There are no events or conditions which could result in the simultaneous, or consequential loss of both required circuits from the offsite network to the onsite electric distribution system.

A detailed review and technical evaluation of these proposed modifications and changes to the Appendix A of the license was performed by EG&G Idaho, our consultant, regarding this matter. This work is reported in EGG-EA-5345, "Technical Evaluation Report, Degraded Grid Protection for Class 1E Power Systems, Three Mile Island Nuclear Station Unit 1 Docket No. 50-289, TAC No. 10055" dated April 1981 (Attachment 1).

The modifications to the onsite emergency power systems and changes to Appendix A of the license proposed by Met Ed are as follows:

1. All electromagnetic relays on the 4160 volt safety buses will be replaced by solid-state instantaneous relays and timers. Three relays on each bus will be arranged in a two-out-of-three coincident logic scheme with a voltage setpoint of 58% of nominal bus voltage and a time delay of 1.5 seconds. These relays will trip the safety bus feeder breaker, initiate load shedding, start the respective diesel generator and sound an annunciator in the main control room.

2. For second level undervoltage protection, three additional relays arranged in a two-out-of-three coincident logic will be added to each 4160 volt safety bus. The setpoint of these relays will be 86.4% of nominal bus voltage, and the timer will be set at 10 seconds. The relays will trip the associated safety bus feeder breaker, initiate load shedding, start the diesel generator and trip an annunciator in the main control room.

3. In addition to the previously described first and second level of undervoltage protection, existing relays on the 480 volt safety buses will be used to sound an annunciator in the control room at approximately 92% of the nominal rating of the motors (460V) connected to these buses. This will alert the operators to a low voltage condition to allow them time to shed unnecessary loads to restore voltage and preclude trips if possible.

4. Proposed changes to Appendix A of the license includes the surveillance requirements, allowable limits for the setpoint and time delay, and limiting conditions for operation for the second-level undervoltage protection.

Although the second-level undervoltage protection setpoint is less than the usually specified motor low voltage rating of 90%, it is acceptable due to the combination of: (1) the licensee's documented actually specified equipment ratings including a 1.15 service factor for motors and (2) the conservative approach taken by Met Ed in calculating voltages and the early warning low voltage alarm used on the 480 volt safety buses.

In our letter dated August 8, 1979 we requested Met Ed to perform a voltage analysis including a test, verifying the analytical results of the station electrical distribution system voltages. Met Ed responded by letters dated October 16, 1979 and May 15, 1980. A detailed review and technical evaluation of the submittal was performed by EG&G Idaho. This work is reported in EGG-EA-5258 Revision 1 "Technical Evaluation Report, Adequacy of Station Electric Distribution System Voltages, Three Mile Island Nuclear Station Unit 1 Docket No. 50-289" dated October 1980 (Attachment 2).

The analysis submitted by Met Ed was based upon the proposed changes and operational modifications to their plant distribution system which are detailed in Enclosure 2 of the EG&G Technical Evaluation Report. The analysis was performed assuming both auxiliary transformers available and a single auxiliary transformer available, at the maximum and minimum switchyard (grid) voltage (242 kv and 225 kv respectively). Minimum analyzed terminal voltages are above the levels necessary for satisfactory equipment operation indicated by the licensee. For 460 volt motors the minimum operating voltage level is based upon the fact that the motors have a 1.15 service factor rating but are actually operated at or below nameplate ratings. Maximum analyzed voltages shown are below the equipment rated values, except for 460 volt motors where the voltage is indicated to be slightly above (1%) their maximum rating; but the analyzed voltage given is at the bus, and the voltage at the motor terminals is actually within the maximum rated value.

In the original test verification provided by Met Ed no measured voltages were provided for the safety related motor control centers or 480 volt safety bus 1T. Met Ed has committed to providing the missing bus voltages to us after testing the onsite safety related electrical distribution system. This test which is scheduled for prior to restart will measure bus voltage and loading while the engineered safeguards loads are powered from the diesel generators. This information will then be used to verify the accuracy of the analyzed voltage drops between the previously verified buses and those that were missed.

The criteria used by EG&G in the Technical Evaluation of Met Ed's submittal includes GDC 5 ("Sharing of Structures, Systems, and Components"), GDC 13 ("Instrumentation and Control"), and GDC 17 ("Electric Power Systems") of Appendix A to 10 CFR 50; IEEE Standard 308-1974 ("Class 1E Power Systems for Nuclear Power Generating Stations"); IEEE Standard 279-1971 "Criteria for Protection Systems for Nuclear Power Generating Station"; ANSI C84.1-1977 ("Voltage Ratings for Electric Power Systems and Equipment-60Hz"); and our positions and guidelines in our letters to Met Ed dated June 3, 1977 and August 8, 1979. Based on our review of Met Ed's submittals and the reports (Attachments 1 & 2) issued by our consultant, we find that Met Ed meets the objectives of the criteria for the onsite emergency power systems for TMI-1. In addition, based on this review we conclude that:

1. The proposed degraded grid modifications will protect the Class 1E equipment and systems from sustained degraded voltage of the offsite power source.

2. The proposed changes to Appendix A of the license meet the criteria for periodic testing of the protective systems and equipment, except for the action statement addressing failure of the undervoltage relay in the untripped state. The licensee initially proposed that if an undervoltage relay fails in the untripped state, it shall be placed in a tripped state within 24 hours to obtain a degree of redundancy of 1. We questioned the validity of permitting a relay failure in the untripped state to exist for a 24 hour period. The licensee upon reviewing this matter proposed to reduce the time period of 24 hours to 12 hours which we find acceptable. This acceptance is based on our judgment that undervoltage protection does exist even during the 12 hour period in which the relay is inoperable because of the circuit redundancy and the reduced period is considered an increase in the level of safety. On this basis we find the proposed changes to Appendix A of the license acceptable.

3. Load shedding is disabled once the diesel generators are supplying their respective buses and is reinstated if the onsite breakers are tripped.

4. The second level undervoltage protection setpoint does not infringe into the expected operating envelope and therefore will not be the cause of spurious trips.

5. Met Ed has provided voltage analyses to demonstrate that the Class 1E equipment terminal voltages remain within acceptable operating limits for the postulated worst case conditions.

6. The original test used to verify the analyses was valid and showed the analyses to be accurate for those buses which were included in the test.

7. The proposed test by Met Ed will provide adequate verification of the analysis accuracy for those buses not previously verified. The lack of verifying those buses not previously verified does not affect in any way the proposed changes of this amendment.

8. Met Ed's reaffirmation of compliance with GDC 17 requirements is acceptable.

Based on the above evaluation, we conclude that the proposed plant modifications for protecting safety related equipment from a potential degraded grid voltage and the proposed changes to Appendix A of the license meet our positions and therefore are acceptable. In addition, we find the station electrical distribution system voltages for TMI-1 is adequate and therefore we find it acceptable subject to the satisfactory completion of the verification tests of the analysis accuracy for those buses not previously verified.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Dated: July 29, 1981