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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING THE ADEQUACY OF THE STATION ELECTRIC DISTRIBUTION SYSTEM VOLTAGES

H. B. ROBINSON UNIT NO. 2

DOCKET NO. 50-261

Background

By letter dated January 13, 1988, the NRC requested that Carolina Power & Light (CP&L) Company provide additional information concerning the adequacy of the station electric distribution system (EDS) voltages at H. B. Robinson Steam Electric Plant, Unit No. 2 (HBR2). We were concerned about the adequacy of the HBR2 EDS since it had undergone significant changes, such as addition of loads and transformers, including reduced operating grid voltages. In addition, the licensee had replaced the computer program previously used for EDS analysis with a new computer program for this purpose. The staff had not verified the validity of the new computer program. Therefore, we requested that CP&L perform a new analysis to demonstrate the adequacy of the station EDS with the changes and establish the validity of the new computer program.

During a meeting between the NRC staff and the licensee on October 20-21, 1988, CP&L agreed with the staff that a comprehensive study was needed to resolve questions regarding the adequacy of the EDS. The licensee promised to complete a study of the EDS by January 31, 1989. However, on January 11, 1989, CP&L presented to the NRC their commitment to reconstitute the design basis for HBR2 known as "Design Basis Reconstitution Project (DBRP)." As a part of the electrical DBRP, CP&L performed an EDS study by establishing system level design basis and developing a matrix of required electrical calculations (capacity, voltage, short circuit, and protection/coordination). The staff informed the licensee during the January 11, 1989, meeting that the calculations performed for the EDS study should demonstrate the EDS adequacy at HBR2 and support the results and conclusions of the previous study "Adequacy of the Station Electric Distribution System Voltages" (MPA B-48).

Evaluation

By letter dated July 2, 1991, the licensee submitted a summary of the results of their electrical calculation, "RNP-E-8.002, Rev. 1," to support the electrical power system adequacy for various modes of plant operations including accident conditions. On February 5-6, 1992, the NRC staff performed an onsite audit review of these calculations to assess the adequacy of the EDS.

Our review of the licensee's calculations indicate that:

1. CP&L performed a comprehensive evaluation of the HBR2 EDS which included voltage, loading, and fault current calculations based on the up-to-date system configuration. This evaluation included all equipment associated with the control room habitability modification, non-Class 1E loads, station service transformers, and current limiting fuses.

2. The licensee has performed voltage calculations for the EDS at HBR2 to assess its adequacy for the conditions when the power is supplied via the preferred power supply (the startup transformer at 115 kV switchyard) and via the delayed offsite power source (the unit auxiliary transformer at 230 kV switchyard). It has also been analyzed for steady state and transient load response characteristics based on the lowest and highest acceptable switchyard voltages and continued operability of safety-related equipment. The voltage drop calculations performed by the licensee followed closely the guidance provided in Branch Technical Position PSB-1. Our review of the above calculations indicates that the switchyard voltages for the 115 kV (113.1-117.5 kV) and for the 230 kV (220.4-236 kV) are acceptable.

3. The licensee explained that Ebasco computer program which was used in their previous study (MPA B-48) had been replaced by new ASDOP computer program in 1982. Prior to replacing the Ebasco program with the ASDOP, the licensee validated the ASDOP program by comparing the results of ASDOP and Ebasco program, and by comparing ASDOP results with actual field test data obtained for three different cases. Our review of these documents finds that a good correlation exists between the analytical results (ASDOP program) and the actual field test results. We have concluded that the ASDOP program correctly represents the HBR2 EDS, thus establishing the validity of the mathematical model used in performance of the EDS analyses in accordance with the PSB-1 criteria. The licensee has stated that ASDOP program will be used to evaluate any future EDS modifications at HBR2.

4. An Electrical Distribution System Functional Inspection (EDSFI) was conducted at the HBR2 during September 23 through October 25, 1991. The EDSFI team has reviewed these calculations (i.e., RNP-E-8.002) and has concluded that the HBR2 EDS was adequately designed and is being maintained to accomplish its intended safety function. The EDSFI report also noted that the EDS calculations performed by the licensee show a limited margin for future load growth and that the licensee was aware of these limitations and had mechanisms in place to monitor and control future load growth.

Conclusion

Based on our review of the calculations performed and the field test results, we have concluded that the HBR2 EDS is acceptable with regard to steady state and transient load response characteristics and system fault protective features, and that the validity of the ASDOP program has been verified.

It is noted, however, that this evaluation does not address conformance of the EDS design to General Design Criterion (GDC) 17 with regard to the availability of the required delayed offsite power circuit. The existing HBR2 design (which is part of the licensing basis) provides this delayed access circuit by feedback through the main and unit auxiliary transformers after removal of the generator disconnect link. This does not meet GDC-17 in this regard since the licensee has not demonstrated that removal of the disconnect link can be accomplished in sufficient time to prevent fuel design limits and design conditions of the reactor coolant pressure boundary from being exceeded.

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Dated: June 3, 1992