SAFETY EVALUATION REPORT

NORTH ANNA UNITS 1 AND 2

SEISMIC QUALIFICATION OF THE AUXILIARY FEEDWATER SYSTEM

I. Introduction and Background

On August 8, 1980, the Division of Safety Technology (DST) transmitted the results of a study on the seismic capability of decay heat removal systems to the Division of Licensing (DL). That study included a simplified probabilistic risk analysis and recommendation for action by DL. Since August 1980, this subject has been the topic of additional correspondence relative to NUREG-0667, "Transient Response of Babcock and Wilcox-Designed Reactors," and has been discussed at several ACRS meetings and at planning sessions with DL and the Office of Nuclear Regulatory Research (RES). As a result of these concerns, and to assure conformance of each plant with General Design Criteria 2 and 34 of Appendix A to 10 CFR Part 50, "Multiplant Action Plan C-14: Seismic Qualification of Auxiliary Feedwater Systems" was formulated.

The purpose of this plan is to determine the extent of the seismic qualification of the auxiliary feedwater (AFW) system for all operating Pressurized Water Reactors (PWRs). For plants with AFW systems that are not seismically qualified, either in whole or in part, this plan ultimately involves increasing the seismic resistance of the systems in a timely, systematic manner, where necessary. Upgrading of the AFW systems will be required to the extent that is appropriate to provide reasonable assurance that they are able to function following the occurrence of earthquakes up to and including the design Safe Shutdown Earthquake (SSE) for the plant.

To identify those plants without AFW systems, or portions thereof, which have been designed, constructed and maintained (and included within the scope of seismic related IE Bulletins 79-02, 79-04, 79-07, 79-14, and 80-11, and IE Information Notice 80-21) as seismically qualified systems in accordance with the criteria for other safety-grade systems at the facility, NRC Generic Letter 81-14, "Seismic Qualification of Auxiliary Feedwater Systems," dated February 10, 1981, was issued under 10 CFR 50.54(f) to all operating PWR licensees. This letter also requested walk-downs of the equipment, components and piping comprising those portions of the AFW system which were not designed, constructed and maintained as seismically qualified systems in accordance with the criteria for other safety-grade systems at the facility.

These walk-downs were to be performed by personnel experienced in the analysis, design and evaluations of structures, systems and components similar to those comprising the non-seismically qualified portions of the AFW system to identify any readily recognized deficiencies in seismic resistance and to recommend any appropriate remedial modifications. Any corrective actions taken, or planned, were to be described, and a schedule for the planned corrective actions provided. Similar considerations as those described above were to be given to alternate decay heat removal paths in those cases where portions of the AFW system are not seismically qualified.

The bounds to be considered for these systems were defined as follows:

> In responding to this letter, the AFW system boundary from suction to discharge (including the water source and heat sink) shall include those portions of the system required to accomplish the AFW system function and connected branch piping up to and including the second valve which is normally closed or capable of automatic closure when the safety function is required. The AFW system boundary shall also include any portion of branch piping that is structurally coupled to the AFW system boundary such that the seismic response of the branch piping transmits loads to the AFW system. As a minimum, this includes the branch lines outside the AFW system boundary to a point of three orthogonal restraints. All mechanical and electrical equipment, piping (e.g., instrument air), conduits and cable trays, which are necessary or contain items which are necessary, for the operation of the AFW system shall also be considered. In addition, the structures housing these systems and components shall be included. Similar considerations shall be applied when considering alternate means of decay heat removal.

Discussion

Virginia Electric and Power Company (VEPCO) submitted the information requested for North Anna Units 1 and 2 in NRC Generic Letter 81-14 via lettters from R. H. Leasburg to Harold R. Denton, dated July 16, 1981, and December 1, 1981. This information indicated that:

1) The safety-related portions of the AFW system (including the structures within which they are housed) are designed, constructed and maintained (and included within the scope of IE Bulletins 79-02, 79-04, 79-07, 79-14, and 80-11, and IE Information Notice 81-21) in accordance with seismic criteria consistent with those for other safety grade systems in the station. These portions are considered Seismic Category I. The portions of the AFW system considered are consistent with the bounds defined in GL 81-14, with one exception, discussed in 2 below.

2) One of the boundaries of North Anna's AFW system is the first isolation check valve outside of the containment in the steam generator feed lines. However, the postulated failure of this single valve in a line is bounded by the analysis of a Major Rupture of a Main Feedwater Pipe, contained in FSAR Section 15.4.2.2. This analysis concludes that the AFW system will provide adequate feedwater to the unaffected generators for required heat removal in the event of a Major Rupture of a Main Feedwater Pipe.

3) The primary water source (Condensate Storage Tank) is considered safety-related and is seismically qualified.

Evaluation

The NRC staff and its consultants have reviewed the information in the July 16, 1981, and December 1, 1981, VEPCO responses to Generic Letter 81-14 concerning the seismic qualification of the North Anna Units 1 and 2 auxiliary feedwater systems. Based on this review we have determined that:

1) The appropriate safety-related portions of the North Anna Units 1 and 2 AFW system, including the structures housing them, are Seismic Category 1 and have been designed, constructed and maintained to resist an SSE in accordance with the seismic criteria applicable to other safety grade systems at the facility, and therefore, are seismically qualified.

2) GL 81-14 required that seismic qualification should be considered to the "second valve which is normally closed or capable of automatic closure when the safety function is required." North Anna Units 1 and 2 incorporate a single Seismic Category I isolation check valve in each of the steam generator feed lines outside of containment. Should failure of one of the valves be postulated, such failure would be acceptable since this condition would be bounded by the analysis of a Major Rupture of a Main Feedwater Pipe, contained in FSAR Section 15.4.2.2. This analysis demonstrates that the AFW system will provide adequate feedwater to the unaffected generators for required heat removal.

3) The primary water supply (Condensate Storage Tank) is seismically qualified, therefore, Generic Letter 81-14 did not require information regarding a secondary water supply.

Conclusion

We find that the SSE seismic qualification of the appropriate portions of the North Anna Units 1 and 2 auxiliary feedwater systems is consistent with that of other safety grade systems at the facility. Therefore, there is

reasonable assurance that it will function following the occurrence of earthquakes up to and including the SSE for the plant. On this basis, the VEPCO responses to Generic Letter 81-14 are acceptable. No further actions are required on the part of VEPCO for North Anna Units 1 and 2, pending the outcome of the long-term studies discussed in "Multiplant Action Plan C-14: Seismic Qualification of Auxiliary Feedwater Systems."