GE Nuclear Energy

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Attention: Charles L. Miller, Director
Standardization and Non-Power Reactor Project Directorate

Subject: **GE Response to Discussion Item 1 of January 1, 1991 GE/NRC Conference Call Pertaining to Seismic Review Portion of ABWR SSAR**

Enclosed are thirty-four (34) copies of the GE response to Discussion Item 1 (The Impact of Changes in the Seismic Hazard Function on the ABWR Seismic Screening Procedure) of the subject conference call.

It is intended that GE will amend the SSAR, where appropriate, with this response in a future amendment.

Sincerely,

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The Impact of Changes in the Seismic Hazard Function on the ABWR Seismic Screening Procedure

In performing the AWBR seismic PRA, the procedure started with the consideration of seismic initiated accident sequences, and the construction of accident event trees. A preliminary screening analysis indicated that the dominant accident sequences as a result of the earthquake would all be sequences initiated by the loss of offsite power, and that other sequences (sequences where offsite power was not lost) would be relatively insignificant. One reason for this is that the fragility of ceramic insulators in the switchyard is very much lower than the fragility of other components and structures.

The next consideration in the screening process was the effect of structural failures with the conservative assumption that structural failure would be sufficiently complete to render inoperative all equipment within the structure. Therefore, structural failure was taken to result directly in core damage.

As a result of the two considerations above, it was found that in cases where there is no structural failure and offsite power is not lost, the frequency of core-damaging accidents is negligible. Since all cases of structural failure result directly in core damage, the only remaining accident sequences to be analyzed are for cases of no structural failure, but with loss of offsite power.

[Increases in the magnitude of the seismic hazard function would result in a higher probability of core damage due to building failure, but would not affect the above screening rationale.]

When there is no structural failure, but offsite power is lost because of the seismic event, the most important concern is whether or not emergency power and service water are available, since the loss of either support function presents the most serious challenge to the plant. Thus, it is important to evaluate accident sequences involving these losses. The vital safety equipment involved in these accident sequences includes the AC and DC emergency power systems, service water systems, RCIC, RHR, and AC-independent water makeup. All of these systems require treatment in the seismic analysis of these accident sequences.

If neither emergency power or service water are lost, there are still potentially significant accident sequences involving other functions and equipment. The first concern is whether or not there is a successful scram or alternate rod insertion. The RPS, CRD, and ARI systems are all involved in successful scram, but these systems need not be analyzed if the failure of the control rods to insert is dominated by the relatively low seismic fragility of the fuel assemblies and control rod guide tubes and housings. If it is not possible to insert control rods, SLC can be used to effect shutdown. Failure of the SLC system is dominated by failure of the pumps and boron supply tank.

Given successful scram with emergency power and service water available, the remaining vital functions needed to prevent core damage are the maintenance of the inventory of water in the reactor and the removal of decay heat from the reactor and containment. The additional systems required to perform these functions are the HPCF, ADS, and LPFL.

[Changes in the shape or magnitude of the seismic hazard function should not affect any of the above screening criteria.]

The systems that need to be included in the seismic analysis are the emergency power systems, the service water systems, RCIC, RHR, firewater, SLC, HPCF, and LPFL. Additionally, consideration of seismic effects must be given to structures, reactor depressurization, and alternate means of injecting boron.

Within the systems and functions identified for inclusion in the seismic analysis, the components selected for inclusion are those components that perform an active safety function and whose operation could be affected by an earthquake. Passive components also included in the analysis are pipes, ducts, electrical buses, cable trays, heat exchangers, tanks, and battery racks.

[Since all vital components within the screened systems were included in the analysis, increases in the magnitude of the seismic hazard function would not affect the selection of components to be analyzed.]

Systems and equipment which require offsite power, such as feedwater and condensate systems, are not modeled since offsite power is assumed to not be available. RPS, ARI, RPT, and CRD are not modeled since failure of control rods to insert is caused predominantly by changes in core geometry due to the earthquake. All other important systems are included in the analysis.