Davis-Besse Nuclear Power Plant, Unit 1
Licensing Basis Seismic Ground Motion Concern

Concern: During original review prior to operation, ACRS Committee believed 0.20g bedrock ground acceleration was more appropriate for Davis-Besse (DB) site than 0.15g used for design of structures, systems, and components.

Paragraph 2C.3.4 of DB USAR [Revision 28] indicates Maximum Possible Earthquake (SSE) design acclerograms were derived using 0.15g maximum ground acceleration. DB USAR specifies seismic design based on 0.15g not 0.20g for SSE. OBE seismic response spectra derived from SSE spectra using 0.08g/0.15g ratio.

References: NUREG-0136; Safety Evaluation Report Related to the Operation of Davis-Besse Nuclear Power Station Unit 1; December 1976

Supplement No. 1 to NUREG-0136; Safety Evaluation Report Related to the Operation of Davis-Besse Nuclear Power Station Unit 1; April 1977

Toledo Edison Letter to NRC dated January 27, 1977; Subject: Applicant Position for Using 0.15g SSE Acceleration

NRC Letter to Toledo Edison dated January 30, 1977; Subject: Guidelines for Applicant Seismic Reanalysis and Evaluation

Toledo Edison Letter to NRC dated February 24, 1977; Subject: Applicant Summary Report for Basis Using 0.15g SSE Acceleration

Toledo Edison Letter to NRC dated March 4, 1980; Subject: Application to Facility Operating License [request modification in DB-1 License Condition 2.C.(3) (r)]

NRC Letter to Toledo Edison dated August 27, 1980; Subject: Amendment No. 30 [deleted satisfied License Condition 2.C.(3) (r)]

NRC Letter to Toledo Edison dated May 31, 1983; Subject: Seismic Reanalysis of Piping and Components [NRR Safety Evaluation attached]

Discussion: During review to determine current design and licensing bases for DB shield building, Supplement No. 1 to NUREG-0136 documented ACRS Committee concern that 0.20g ground acceleration was more appropriate than 0.15g used in design.

The Committee recommended that the staff review in detail the plant systems needed to accomplish safe shutdown of the reactor and continued heat removal for a safe shutdown earthquake acceleration of 0.2g and that Regulatory Guide

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1.60, "Design response Spectra for Seismic Design of Nuclear Power Plants," should be applied at the foundation level of the facility.

Staff agreed with Committee and conditioned the license to require the analysis and evaluation be completed prior to startup following the first regularly scheduled refueling outage.

As indicated in the above references, staff provided reanalysis guidance, license condition was established, license amendment deleted license condition, and NRR issued Safety Evaluation for the reanalysis review.

Of note, the licensee documented the position that 0.15g was appropriate – see above references. However, these letters predate the removal to the license condition and the NRR Safety Evaluation.

Evaluation: Licensee demonstrated adequate design margin for systems evaluated using a 0.20g ground motion and response spectra in accordance with Regulatory Guide 1.60.

Licensee was able to utilize higher piping system damping permitted in Regulatory Guide 1.61 – original licensee calculations used conservative damping.

Systems and components reanalyzed demonstrated adequate design margin for 0.20g ground motion.

Concern: What is the appropriate licensing basis maximum ground acceleration (SSE) at bedrock, 0.20g per ACRS Committee and licensing condition or 0.15g per Paragraph 2C.3.4 of DB USAR?

Non-conservative design scenario:

- Licensee modifies one of the reanalyzed systems or components
- Licensee uses Regulatory Guide 1.61 higher damping values
- Using seismic loading based on 0.15g ground motion would not be in accordance with ACRS Committee or prior licensing condition

Of note, recent functionality evaluations for shield building laminar indicated additional margin could be captured using higher SSE damping 7% damping for reinforced concrete permitted by current revision of Regulatory Guide 1.61.

- The functionality evaluation based on 0.15g not 0.20g maximum ground acceleration – shield building is anchored to bedrock.
- Will licensee use 7% damping for revised design

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Followup: Requested licensee to provide their licensing position regarding DB seismic licensing basis – 0.15g vs 0.20g horizontal ground motion for maximum possible earthquake.