



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON D C 20555

November 2, 1978

Docket No. 50-247

MEMORANDUM FOR: D. K. Davis, Chief, Systematic Evaluation Program
Branch, DOR

FROM: H. A. Levin, Systematic Evaluation Program Branch, DOR

SUBJECT: SUMMARY OF MEETING WITH COMMONWEALTH EDISON COMPANY -
SENIOR SEISMIC REVIEW TEAM TOUR OF DRESDEN UNIT NO. 2

On October 23 and 24, 1978, the Senior Seismic Review Team (SSRT) met with representatives of Commonwealth Edison Company (CECO) (Members of SSRT and Attendees listed in Enclosure 1) to tour the Dresden 2 facility, to discuss technical questions relative to the seismic design of Dresden 2 and to identify and obtain seismic design information not available on the Dresden 2 docket. The meeting agenda is attached (Enclosure 2).

The October 23 morning session convened shortly after all attendees had completed a security and health physics indoctrination. Dr. Nathan M. Newmark, Chairman of the Senior Seismic Review Team, opened the meeting with a discussion of the purpose and scope of review of the SSRT seismic review of Dresden 2 (see Enclosure 3). After this discussion, Paul O'Connor, Dresden 2 Project Manager, and Howard Levin, Systematic Evaluation Program Branch, Seismic Coordinator, summarized details of the NPC staff and consultants review of the Dresden 2 docket and identified structures, components and systems which the SSRT desired to view on the tour. The following summarizes the discussion and identifies sources of docketed information that addresses items 1 through 12 of the SSRT request for information (letter dated October 1, 1978, from D. Ziemann to C. Reed).

1. Identification of specific reactor coolant system (RCS) components and any systems attached to the RCS which must retain their integrity during a seismic event to prevent a LOCA and ensure that safe shutdown equipment will function including minimum auxiliary systems and equipment that must function during and after a seismic event to safely shutdown and cooldown the reactor. This includes power supplies and instrumentation necessary for operation of safe shutdown equipment and necessary for the monitoring of core parameters.

Reference: FSAR 12.1.2

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MATERIAL FOR ENCLOSURES
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A. LOCA Prevention

- 1) Reactor Coolant system, including reactor vessel supports, recirculation pumps and supports, recirculation and riser piping.
- 2) All penetrations to reactor coolant system, including feed-water, steam, reactor water clean-up, HPCI, core spray, LPCI, etc. This is necessary only to the outermost containment isolation valve (except as noted below).
- 3) Main steam isolation valves, plus electromatic (4) and electro-pneumatic (1) relief valves.
- 4) Control rod drive hydraulic system, including piping to drives and electrical supplies.
- 5) Piping support systems (especially snubbers).

B. Assuming total loss of offsite power and no LOCA, the following safe-shutdown systems, in their entirety, should be reviewed. Some are also in Section A. above and some serve as backups in case "first line" systems are lost.

- 1) Isolation condenser
- 2) Isolation condenser fill systems
 - a. Clean demineralized H_2O
 - b. Contaminated demineralized H_2O
 - c. Fire water (actually service H_2O) - note Unit 2/3 tie-ins to Unit 1 screen wash pumps and diesel driven fire pump
- 3) Shutdown Cooling System
- 4) Reactor Building Closed Cooling Water System
- 5) Service Water System (crib house) (UMS)
- 6) 4 KV Emergency Buses - applicable cabling
- 7) 480 V Emergency Buses - applicable cabling
- 8) 125/250 VDC System (batteries) - applicable cabling
- 9) Diesel Generator Systems - applicable cabling - including fuel supplies and starting systems

- 10) Necessary systems sensors, cables and power supplies
- 11) EMRV's target rock

Backups

- 12) HPCI
 - 13) LPCI
 - 14) Containment cooling service water
 - 15) Standby Liquid Control System
 - 16) Core Spray System
 - 17) Reactor Water Cleanup System
2. A summary or abstract of the seismicity of the site, and the local foundation and soil conditions.
- Reference: FSAR Section 2.7, PDAR Section I-2.5, I-2.8, III-2.0, III-4.0, Letter Report, "Geology and Hydrology of the Site of the Dresden No. 2 Unit, a Proposed Nuclear Power Plant, Grundy County, Illinois (AEC Docket No. 50-237)" - E. L. Meyer and Alfred Clebsch, Jr., U.S. Geological Survey.
3. The specific values of OBE and SSE or equivalent site ground motions used in design.
- Reference: FSAR 12.1.1.3
- OBE - 0.1 g vertical acc. = 2/3 horz. acc.
SSE - 0.2 g
4. The design spectra including ground and floor spectra for various damping levels actually used, for both OBE and SSE, for various structures and equipment.
- Reference: FSAR Figure 12.1.2, 12.1.3, Amendment 13 - A.6, AM 13 Figure II.A.1, Amendment 19 - B.6 (FSAR 12.1.1.3, AM 13 - A.11 - Damping)

Floor amplified response spectra were not found on the docket. CECO provided floor spectra computed by John A. Blume and Associates (see Enclosure 4).

In addition, the following document dated November 3, 1965, was submitted, "Dresden Unit 2 Nuclear Plant - Recommended Earthquake Criteria", for General Electric by John A. Blume and Associates (Enclosure 5).

The El Centro earthquake time history was used in the analysis of the reactor turbine building, ventilation stack and drywell.

5. The load combinations used in the design of the various safety-related or Category I structures and components of the facility.

Reference: FSAR 12.1.1.3

6. The design allowable stresses, design codes, and/or other criteria used for the Category I structures and components.

Reference: FSAR 12.1.1.3, Table 12.1.1

7. A tabulation of total combined stresses for key items, listing the individual contribution of dead load, live load, seismic, thermal and pressure, etc.

Reference: Amendment 13 - Supplementary Seismic Design Information, Amendment 13 - Seismic

CECO provided the following additional information (Enclosure 5).

- a) "Earthquake Analysis: Main Steam Lines", May 27, 1968.
- b) "Earthquake Analysis: Suppression Chamber Ring Header", August 29, 1968.
- c) "Report on the Earthquake Analysis of the Ventilation Stack", May 25, 1967.
- d) "Earthquake Analysis: Isolation Condenser", June 16, 1967.
- e) "Earthquake Analysis: Drywell", January 24, 1967.
- f) "Earthquake Analysis: Recirculation Loop Piping", December 6, 1968.
- g) "Earthquake Analysis: Reactor-Turbine Building", January 19, 1967.

The above reports were written by John L. Blume and Associates for General Electric Company.

- h) "Earthquake Analysis: Feedwater Lines", June 1, 1968, H. J. Sexton and Associates for General Electric Company.
 - i) "Economic Impact of Seismic Requirements on Nuclear Power Stations", E. B. Branch and R. J. Small, Paper GEC-P94, General Engineering Conference, Chicago, Illinois, March 11 - 12, 1971 (Enclosure 6).
8. List of equipment that have been seismically qualified, to what level and the method of qualification of each.
- Reference: Amendment 19 - 6.B
9. A summary of changes to the facility as described in the FSAR which affect seismic Category I systems and structures.
- Reference: Application for Full-Term Operating License, March 1977
10. A brief summary of tests and inspections of seismic Category I structures and systems identified in Question 1 which document the operating history of these items.
- Reference: Application for Full-Term Operating License, March 1973, Section 2.1
11. Pressure test reports on the containment, or at least a summary of the results obtained in such tests.
- Not located.
12. Any other pertinent information that would be helpful to the SSRT.
- CECo provided photographs of various restraint installations in the plant.

The afternoon plant tour started directly after a break for lunch. The large group was broken down into several smaller groups of five or six individuals. The items viewed of particular interest included control room instrument panels and electrical panels, cable tray supports, piping and component supports, large valves, battery racks, the isolation condenser, core spray and LPCI pumps, diesel generators, torus supports CRD hydraulic

modules, and the Unit 2/3 crib house, circulation water and service water pumps. The tour was restricted to areas outside the drywell since the plant was operating. After the tour, the meeting reconvened to discuss items of interest and identify information required for the next days meeting.

On October 24, detailed engineering discussions were held in the Chicago offices of Sargent and Lundy, the original Architect - Engineer for Dresden 2. At the conclusion of the general technical discussion, the SSRT caucused to summarize their findings, establish the need for additional information and identify assignments for members of the SSRT. The meeting reconvened after the caucus at which point Howard Levin summarized to CECO and their consultants the need for additional information in the following areas.

1. Clarification of the conservatism of using the El Centro time-history acceleration record with respect to frequency ranges where the El Centro response spectrum valleys fall below the design response spectrum; addressing whether the record was baseline corrected. The SSRT is specifically interested in determining whether this acceleration record was used to compute floor response spectra and if equipment falls in deficient frequency bands.
2. Clarification concerning the generation of floor response spectra addressing the method used to compute these spectra and for which facility they were computed.
3. Summary of analytical or qualitative methods of handling the effects of large eccentric masses (valves) on the piping system.
4. Brief summary addressing the seismic design of the reactor building crane including the actual input acceleration level used in design.
5. Design specifications including the seismic specifications or just the seismic specification if separate, for three examples of the following equipment.

In addition, a design (stress) report for each of these equipment categories to the degree possible. The SSRT would like to review a cross-section of equipment located in different buildings, different elevations in those buildings and different manufacturers.

- a) column supported tank
 - b) skirt supported tank
 - c) vertical heat exchanger or cooler
 - d) horizontal heat exchanger or cooler
 - e) vertical pump
 - f) horizontal pump
 - g) motor
 - h) transformer
 - i) control panel
 - j) switch gear
6. Summary of design criteria used for the design of cable trays and duct work including any generic evaluations made.
 7. Summary of design criteria for the design of the battery racks and/or design drawings and mass data to permit a scoping evaluation by the SSRT. The SSRT is specifically interested in quantifying the torsional effects due to varying longitudinal deformation of the racks.
 8. An example of the methods of calculating stresses in the concrete and steel at the base of the reactor building outside wall for given shears, tension/compression and moments; discussing which loads were actually used (statically or dynamically determined) and whether checks were made to verify later analytical results.

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Enclosures:

1. List of Attendees
2. Meeting Agenda
3. Charter of SSRT
4. Dresden 2 Amplified
Floor Response
Spectra
5. Misc. Design Reports
(as stated)
6. Technical paper
(as stated)