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16 May 1968

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D.C. 20545

Re: Contract No. AT(49-5)-2667
Dresden Nuclear Power Station Units 2 and 3
AEC Dockets No. 50-237 and 50-249
Operating License Review

Dear Dr. Morris:

Dr. W. J. Hall, Dr. W. H. Walker and I have reviewed Volumes I and II of the Safety Analysis Report (SAR) for Dresden Units 2 and 3. The information presented in the SAR is not clearly enough presented to enable us to assess the adequacy of the analysis and design. The purpose of the questions asked herein is to obtain a description of the design process in such detail as to provide a basis for making a judgment as to the margin of safety. It is quite likely that a number of additional questions will be forthcoming after our visit to the site on May 24th.

1. In Section 6 of the SAR dealing with engineered safeguards, there is a description of a number of motor-pump units that appear to be located on the lower levels of the reactor building. Many of these systems are vital to safe shutdown and containment in the event of an accident. What steps have been taken to provide protection for these motor-pump units from flooding through possible leakage from the torus or from various piping systems?

2. A study of the SAR indicates that a suction header is used with the torus for the pressure suppression system. Information is requested

1799

on the dynamic analysis of the suction-header-torus system and the details that would insure that difficulties with this system will not occur under earthquake loading.

3. In Section 3 of the SAR there is a discussion of the reactor vessel and internals. With regard to the design of the core shroud and the jet pumps, information is requested as to the analysis that was made to insure that relative motion of these elements will not cause damage to the jet pumps.

4. With regard to the reactor vessel-drywell system, a detailed description is requested concerning the manner in which the supports carry the vertical loads from the reactor vessel down through the pedestal into the lower structure, and also the manner in which lateral forces are carried through to the drywell and exterior supports.

5. The conceptual models employed in the dynamic analysis of the drywell, reactor building, and turbine building are presented in Section 5 and Section 12 of the SAR. The information presented is either insufficient to evaluate the results as given therein, or incompletely described. Specific questions follow.

(a) With regard to the model pictured in Fig. 5.2.17 and again in Fig. 12.1.8, clarification is required as to the significance of the spring numbered 14 in Fig. 12.1.8 which it is presumed is the same as the connecting link numbered 15 in Fig. 5.2.17. What is the significance of the solid linkage numbered 15 in Fig. 12.1.8 which appears to be similar to the connecting link numbered 16 in Fig. 5.2.17 and shown with a spring there. Clarification of the nature of this coupling of the systems is requested, along with values of the spring constants.

(b) In addition, although the differences in values are not great, comment is requested on the difference in mass values shown on the two figures cited. Also what are the spring values assumed for the drywell, reactor building and turbine building?

(c) Is vertical excitation of these units considered? If so, list the applicable mass and stiffness values. Also provide typical accelerations, load and deflection results.

(d) In Fig. 12.1.11, it is noted that in the turbine building an acceleration as high as 2.4g is noted at about the 580 ft. elevation level. Discussion of the manner in which this loading was handled in design is requested.

(e) The drywell moment diagram is presented in Fig. 5.2.25. Additional comment concerning the moments shown there are required in order to gain an understanding of the mode of behavior. From the shear diagrams and accompanying sketches of the model it is assumed that the drywell is held against lateral motion at elevation 575 and at the base as shown in Fig. 5.2.17. The moment diagram corresponds roughly to that which would be associated with a free standing cantilever fixed at the base and subjected to a uniform loading. With some degree of fixity at an upper level one would expect the moment diagram to be irregular with possibly a sign reversal, but such behavior is not evident in Fig. 5.2.25. It is noted in Fig. 5.2.23 that the drywell undergoes some displacement at the 575 ft. elevation level which would tend to reduce the tendency for reversal in moments. However, the small displacement shown there, on the order of 60 mils, hardly seems enough to lead to a major relaxation in moment. In fact it would seem that the moment diagram should be something on the order of that for a proposed cantilever unless possibly the moments are summed maximum, etc. Clarification is required.

Also, provide information concerning the design of (a) the drywell and (b) the reactor vessel support structure that leads to the assumption of base fixity under horizontal and vertical loading. How is base fixity assured structurally?

6. The general design criteria for the primary containment, the reactor building, primary pressure vessel supports and the reactor primary vessel internals and emergency cooling systems are summarized in Section 12.1.1.3 of the SAR. Comments on these follow:

(a) Missing from the list just noted is that of piping other than for the ECCS system. The piping loading and stress design criteria are requested.

(b) With regard to the loading combination involving the maximum earthquake for each of the items just cited, additional information is requested as to the implementation of the criteria employed in the analysis and design. This discussion of implementation of criteria is requested for each major component listed in Section 12.1.1.3 and for piping systems also.

For example under "primary containment (including penetrations)," it is noted that if the total stress exceeds yield, an analysis is made to determine that the energy absorption capacity exceeds the energy input from the earthquake. An example of this type of calculation is desired.

For the reactor primary vessel internals it is noted that the strains are limited to preclude failure by deformation, etc. An example of the implementation of this criteria is requested. Evidently this same criterion is followed for the ECCS piping and comments on the application of this criterion to the design of such systems is requested.

7. For major categories of Class I items, a report on the seismic analysis details, giving as a minimum the following information, preferably through the use of specific examples, is requested.

(a) The analytical model used, the location of the lumped masses, the values of parameters used, and identification of support conditions. For the piping or equipment provide justification for the boundary conditions assumed in the analysis.

(b) Mode shapes, frequencies, and participation factors if modal analysis procedures are used.

(c) The method employed in combininb the modal values to obtain the design values of the acceleration, seismic force, shears and/or moments.

(d) The resultant design values actually used and explanation of the differences from analytical results if any.

(e) Justification for use of, and selection of, values of the seismic coefficient if (b) and (c) steps were not performed in the analysis.

(f) A description of the support conditions and inner connections where complex systems were considered, and a discussion of the basis of the analysis leading to the decision that the systems could be decoupled for purposes of analysis and design.

(g) The application of the stress and deformation criteria to the actual proportioning, especially for the cases involving the maximum earthquake.

8. In cases where equipment or items are supported in or on a building or other structural system and the input motion to the equipment is assumed to be that of the structure at the point of support of the equipment, discuss the reasons for using the relative motion of the building to ground

as input motions to the equipment rather than the absolute motion in space of the support points of the equipment.

9. It is noted that the control room is located on the east end of the turbine building. It is noted in Fig. 12.1.19 that accelerations at various levels in the control building are given. However, in comparing these acceleration values with those shown in Fig. 12.1.11 for the turbine building, it is obvious that the two levels of acceleration are substantially different, which suggests that the input may be from a different source or that the systems are not interconnected. Clarification is requested as to the interconnection, if any, between the turbine building and the control room and the reasons for the large differences in acceleration values that appear to exist under the earthquake excitation.

Further, information is requested as to the procedures that are being taken to insure that the instrumentation located in the control room complex, including the instrumentation required for shutdown, can withstand the dynamic excitation.

Respectfully submitted,

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bjw
cc: W. J. Hall
W. H. Walker