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ComEd

July 5, 1995

TPJLTR 95-0077

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Dresden Nuclear Power Station Units 2 and 3 Response to Request for Comments on Review of Preliminary Accident Sequence Analysis of an Operational Condition at Dresden, Unit 2.

Reference:

(a) J. F. Stang letter to D. L. Farrar transmitting request for comments on Preliminary Accident Sequence Presursor Analysis of an Operational Condition at Dresden Unit 2 dated May 26, 1995

(b) R. D. Fowler (INEL) letter to L. Raney, transmitting "Dresden Station Transmittal of the SAPHIRE 5.0 Codes and Dresden Databases," dated February 8, 1995

(c) P. L. Piet letter to NRC, transmitting "Dresden Nuclear Power Station Units 2 and 3, Response to NRC Request for Additional Information (RAI), dated October 28, 1994.

The enclosed Attachment is ComEd's response to the request for comments on the technical adequacy of the preliminary Accident Sequence Precursor (ASP) of an operational condition which was discovered at Dresden Unit 2. The main focus of the comments is to correct the description of the event, to provide additional information on plant configuration, and to discuss the modeling assumptions used by the NRC. Comments on the use of generic versus plant-specific models for probabilistic risk assessment (PRA) are also included.

The main points in the Attachment are as follows:

The preliminary NRC analysis defines an "Importance" value for the event as the resulting increase in core damage probability. The "Importance" calculated in the preliminary NRC analysis is **2.1E-06.** (Note that under current NEI guidelines on PRA applications, a temporary plant change giving a core damage probability increase of less than 1E-06 is not risk significant.)

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The preliminary NRC analysis assumed that the event made Unit 2 HPCI unavailable for one month (i.e., 720 hours); A clarification of the event description is provided to explain why a ComEd review had determined that the actual Unit 2 HPCI unavailability was probably 107 hours. If the NRC analysis had used 107 hours, the calculated event "Importance" would have been **3.1E-07.**

The preliminary NRC analysis appears to be based on a generic BWR PRA model. Comments, in the Attachment, discuss why use of a generic model is conservative for some accident sequences but non-conservative for others.

Results from the current ComEd PRA model for Dresden 2 gives an "Importance" (as defined in the preliminary NRC analysis) of 7.0E-07 for this event if 107 hours of HPCI unavailability is used. The ComEd PRA model includes many more accident sequences and initiating events than were included in the preliminary NRC analysis.

If your staff has any questions concerning this letter, please refer them to Peter Holland, Dresden Station Regulatory Assurance Supervisor, at (815) 942-2920, extension 2714.

Sincerely,

Thomas P. Joyce
Site Vice President
Dresden Station

TPJ/kls

Attachments: As described

cc: J. B. Martin, Regional Administrator, Region III
J. F. Stang, Project Manager, NRR (Unit 2/3)
P. B. Erickson, Project Manager, NRR (Unit 1)
M. N. Leach, Senior Resident Inspector, Dresden
File: NRC LER 50-237/94021

Attachment

Comments on Preliminary Accident Sequence Precursor (ASP) Analysis of Operational Event at Dresden Unit 2 in August 1994

1. **Does the "Event Description" section accurately describe the event as it occurred?**

The "Event Description" section is accurate, but the addition of other information from the Licensee Event Report (LER) is suggested to clarify the length of HPCI unavailability that resulted from this event. The length of unavailability directly impacts the conditional core damage probability calculation.

As described in the first paragraph of the "Description of Event" section of the LER, the High Pressure Coolant Injection (HPCI) turbine had been operated for approximately 5 minutes at 2500 rpm and then tripped manually for a manual trip verification. The high exhaust pressure trip did not occur during this initial HPCI turbine operation on August 4, 1994. As further described in the LER, the turbine was rolled back up to 2500 rpm for a warming period following the manual trip. The automatic trip on high exhaust pressure occurred approximately one minute into the warming period.

2. **Does the "Additional Event-Related Information" section provide accurate additional information concerning the configuration of the plant and the operation of and procedures associated with relevant systems?**

The information provided deals only with plant response to loss of coolant accident (LOCA) conditions. The preliminary analysis includes calculations for a medium LOCA and transient sequences involving relief valves failing to close, and the information provided is adequate for those sequences.

The analysis also includes calculations for loss of offsite power (LOOP) sequences. However, the NRC analysis appears to be based on a generic, single-unit BWR model. For this reason important Dresden Plant features for dealing with LOOPs are not addressed in this section or credited in the calculations.

- Dresden Units 2 and 3 each have an Isolation Condenser with makeup water provided by diesel-driven pumps. The Isolation Condenser system does not require AC power for core heat removal.

- Dresden Units 2 and 3 have a cross-tie between their 4 kV Division II emergency busses. During a LOOP for Dresden 2 but not Dresden 3, the 4 kV Division II bus for Dresden 2 can be fed either from the Dresden 2 Emergency Diesel Generator (EDG) or via the cross-tie to Dresden 3. Normally, offsite power is fed to Dresden 2 from a 138 kV switchyard, and offsite power is fed to Dresden 3 from a 345 kV switchyard.

3. **Does the "Modeling Assumptions" section accurately describe the modeling done for the event? Is the modeling of the event appropriate for the events that occurred or that had the potential to occur under the event conditions? This also includes assumptions regarding the likelihood of equipment recovery.**

The addition of the medium LOCA event tree as discussed in this section is appropriate. Clarification of the LER discussion is provided below along with suggested changes for other modeling approaches taken in the preliminary analysis.

Length of HPCI Unavailability

The major assumption in the preliminary analysis is that this event caused one month of HPCI unavailability. This section of the preliminary analysis includes the following:

> "The LER stated that the HPCI turbine exhaust check valve had probably failed during the last HPCI operation. It was assumed that the last operation of the HPCI turbine was during the previous monthly surveillance test. Therefore, it was assumed that the HPCI system was unavailable for a 1-month period
> (i.e., 720 h)."

The LER did not explicitly state the length of HPCI unavailability determined by the ComEd analysis of this event. As addressed in the comments on Question 1, above, the last HPCI operation occurred on August 4, 1994, not during the previous monthly surveillance test. The first HPCI operation on August 4 was terminated by a manual trip verification, and the high exhaust pressure trip occurred shortly into the second HPCI operation on August 4. Therefore, the assumption that HPCI was unavailable for 720 hours is overly conservative. ComEd analysis of this event has used a HPCI unavailability time of approximately 107 hours. The period of unavailability began with failure of the HPCI turbine exhaust check valve failure and ended at the time of unit shutdown when HPCI system availability was no longer required.

Using 107 hours of unavailability instead of the 720 hours assumed in the preliminary analysis would reduce the conditional core damage probability calculated for this event by a factor of (107/720) or 0.15. This consideration alone would have reduced the conditional core damage probability given in the preliminary analysis from **2.8E-06 to** 4.2E-07. A similar correction to the "Importance" value given in the preliminary analysis would reduce it from **2.1E-06 to 3.1E-07.**

ADS Reliability

Operator error is the dominant failure of the Automatic Depressurization System (ADS) function in the preliminary analysis, and the operator error rate used was close to that used in the Dresden Individual Plant Examination (IPE). Although less significant, the preliminary analysis appears to use a failure probability of 3.7E-03/demand for hardware failure of ADS. This value appears appropriate for failure of a given relief valve to open, but is overly conservative for hardware failure of the ADS function; the Dresden IPE found that only one of five relief valves was needed for success of the ADS function. For the case of all support systems available (appropriate for the pertinent sequences in the preliminary analysis), the Dresden IPE fault tree analysis gave approximately 5E-08/demand for hardware failure of ADS.

LOOP Modeling

As discussed above in the comments on Question 2, the modeling of the LOOP sequences in the preliminary analysis is overly conservative because the analysis does not credit the Isolation Condenser system and the Division II cross-tie to Dresden 3. Including these systems would greatly reduce to contribution of the LOOP sequences. The preliminary analysis was performed for the NRC by Oak Ridge National Laboratory (ORNL) using the SAPHIRE code. A generic, single-unit BWR model appears to have been used. As a consequence, the preliminary analysis greatly overpredicts the importance of single-unit LOOP sequences, but does not include a contribution from dual-unit LOOP sequences.

Another NRC contractor, Idaho National Engineering Laboratory (INEL) has developed a Dresden model for use with the SAPHIRE code, Reference (b). If the NRC chooses to augment the preliminary analysis, modification of the generic model to add the Isolation Condenser and Division II cross-tie would be unnecessary for Dresden analyses because a Dresden SAPHIRE model is already developed. (Transmittal of the model from INEL to ORNL may be necessary, however. In addition, the Dresden model prepared by INEL is based on the Dresden IPE and does not include significant procedure enhancements, discussed below, that were implemented prior to the August 1994 HPCI event.)

Overall Comparison with ComEd Analysis of HPCI Unavailability

Despite the overprediction of the core damage contribution of the LOOP sequences in the preliminary analysis, the net impact of HPCI unavailability is underpredicted when compared with the current ComEd PRA model for Dresden 2. The current model incorporates procedure enhancements made after the Dresden IPE, but prior to the August 1994 Dresden 2 HPCI event. The enhancements were incorporated in DGA 13, "Loss of 125 VDC Battery Chargers with Simultaneous Loss of Auxiliary Electrical Power," Rev. 04, and DEOP 0500-03, "Alternate Water Injection Systems," Rev. 07.

The current model gives a core damage frequency (CDF) of 3.67E-06/yr for all initiating events, Reference (c).

ComEd calculations based on the current Dresden 2 model give a Risk Achievement Worth (RAW) of approximately 12 for the HPCI system, i.e., the CDF increases by approximately a factor of 12 with HPCI unavailable.

As an alternative to site-specific PRA calculations by an NRC contractor, many ASP analyses involving unavailability of single systems or components could be performed using site-specific RAW values provided by licensees. Given a RAW value such as that above for Dresden 2 HPCI, the event "Importance" as defined in the preliminary analysis can be calculated quickly without the use of a computer code. Following the approach taken in the preliminary analysis, a unit availability of 0.7 is assumed.

Importance = (Conditional Core Damage Probability) - (Core Damage Probability)

= (RAW - 1) * (CDF / 0.7) * (Unavailability)

= (12 - 1) * (3.67E-06/yr / 0.7) * (107 h /8760 h/yr)

= 7.0E-07

This value, obtained easily from the ComEd RAW value for Dresden 2 HPCI, is more than twice the value of 3.1E-07 given above (i.e., the result of the preliminary ASP analysis corrected for the actual unavailability). The higher value is a result of the ComEd PRA model including many more accident sequences and initiating events than included in the preliminary ASP analysis.