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THRU: C. G. Long, Chief, PWR-2 Branch

STATUS OF TMI-1 REVIEW (DOCKET 50-289)

With the filing of Amendment 15 Met-Ed has answered part of our first round of questions. Comments by DRL and DRS are being gathered on that amendment. We expect to meet with Met-Ed in February 1971, after the rest of the questions have been answered (in Amendment 17). In that meeting we will be disclosing our conclusions, and the bases, on a number of matters. These items are discussed in the enclosure.

DRL management comments and concurrence are requested.

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ENCLOSURE

DRL Conclusions on TMI-1 Operating License Application

1. Feedwater Ring Failure

A review of our disposition of feedwater ring failure for the Oconee application is relevant. Our ACRS report number 2 on Oconee, dated September 2, 1970, (Sec. 4.2.2) said that the steam generator feedwater ring header could not withstand the jet forces associated with a break in the nearby reactor coolant piping. Redesign was not considered feasible by Duke, and we agreed. In partial compensation, Duke was to be required to provide increased piping surveillance in the inservice inspection program. Our ACRS report number 3, dated September 15, 1970 (Sec. 4.3) contained an evaluation of additional analyses by Duke. More restraints were to be provided on the reactor coolant piping to preclude failure of the steam generator shell. In Sec. 5.1 of Report 3, we noted that the applicant predicted that there would be a 5.4 psi pressure increase, above the 53.9 psig due to a primary system blowdown, should the feedwater ring also fail. The combined pressure, 59.3 psig, is 0.3 psig above the containment design pressure. We accepted that value on the basis that the 0.3 psi overpressure was small, and that the piping layouts and restraints reduced the likelihood of a combined break.

For Met-Ed, the application contains (p. 4-6, Sec. 4.2.1.2.a) a statement that the main reactor coolant piping is restrained to

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minimize the possibility and consequences of an interacting failure with the secondary system. Since the TMI-1 containment is slightly larger than Oconee (2.0×10^6 ft^3 vs 1.9×10^6 ft^3) the peak pressure due to primary blowdown is 50.6 psig, rather than 53.9 psig on Oconee. If 5.4 psi is added due to feedwater ring failure, the TMI-1 result is 56.0 psig, vs 55.0 design pressure. Test pressure is 63.3 psig.

DRL Position

a. Accept the slight overpressure, but require applicant to document calculation.

b. Request applicant to verify restraint calculations, in view of late changes on Oconee.

c. Incorporate increased inspection program in tech. specs. as for Oconee.

d. Discuss (separately) with B & W a long-range fix on the problem.

2. Fuel Rod Design and Testing

For Oconee (Report No. 2, Sec. 3.3 and Report No. 3, Sec. 3.1) we discussed fuel design and testing. Duke supplied Amendments 18 and 20 that documented surveillance plans for seven fuel assemblies. The center fuel assembly will be inspected following the first outage; four others at the second outage, and two more at the third outage. Base-line measurements will be available.

On Met-Ed we inquired (Question 3.3) about the latest available information on fuel swelling vs. burnup. The answer, on revised p. 3-58, merely promises additional information in 1971 from the B & W High-Burnup program. Related to fuel design is a memo by L. Crocker to J. P. O'Reilly (CO:HQ) dated December 11, 1970, concerning B & W fuel fabrication. There is cause for concern about fuel pellet dimensional tolerances which would bear directly on the clad strain criteria.

DRL Position

a. Notify Met-Ed that answer to Question 3.3 was not sufficient.

b. Require an engineering analysis of clad strain as a function of burnup, both for nominal pellet conditions and for abnormal conditions such as discussed in Crocker's memo.

c. Require the High-Burnup program to be related to the commercial fuel program as related to fabrication processes for tubing and pellets.

d. Request a detailed discussion, not necessarily on the record, of how B & W presently calculates clad strain at EOL conditions.

e. Require inspection on TMI-1 similar to Oconee.

3. Primary Coolant Pump Flywheels

On Oconee the PCP flywheels are of Westinghouse design and were fabricated from A533B plate, vacuum degassed. Baseline surface and volumetric inspections were made. Inservice inspection was proposed and we accepted it. According to TS 15.4.5.1 G for Oconee:

> "Reactor coolant pump flywheels--Each flywheel will receive a volumetric examination of the area of higher stress concentration at the core and key way, in place, during a refueling or maintenance shutdown following approximately 3 years of operation. Each flywheel will be removed and given a complete surface and volumetric examination during a refueling or maintenance shutdown following approximately 10 years of operation."

We asked Question 4.15, to Met-Ed about their flywheel inspection program, both pre- and in-service. Their answer, on revised pages 4-13 and 4-14 states that preservice and inservice inspection will be accomplished. Both preservice and inservice inspection will be done with the flywheels in place, through inspection points on the motor casing. Only the upper face, and rim, of the upper flywheel, and lower face of the lower flywheel will be inspected.

The Met-Ed flywheels are not removable, thus this inspection program constitutes the maximum possible. The Met-Ed flywheel material is a ASTM A-516, Grade 65. This material is lower in yield and ultimate tensile strength than A-533, and has less impact resistance. However, the material and inspection program for Palisades was the same as Met-Ed proposes.

In summary it appears that the Oconee material and inspection program were a "bonus" above what we consider to be minimum.

DRL Position

We should require the same inspection as we did for Palisades.

4. Fracture Toughness Criteria

In October 1970 DRS furnished DRL with 3 draft questions concerning the fracture toughness criteria for the reactor coolant pressure boundary. These questions were discussed with Met-Ed, and B & W, in a meeting on November 24, 1970 (see memo by L. Crocker to R. C. DeYoung dated December 1, 1970). B & W stated that due to the late date of the question in relation to the plant construction, some of the information could not be furnished. We arranged for a later telephone conversation between S. Pawlicki and B & W personnel (with Met-Ed's knowledge and approval). A meeting with B & W and DRS is being planned, on a generic basis.

DRL Position

Withhold formal submittal of the question to Met-Ed until resolution of the issue at the forthcoming meeting.

5. ESF Instrumentation

A study in the November-December 1970 issue of Nuclear Safety (pages 470-471) highlighted the fact that Oconee has less ESF instrumentation than Ginna or Palisades in some areas:

a. BWST level (Ginna 2, Oconee 1)

b. Accumulator pressure (Ginna 2, Oconee 1, Palisades 1)

c. RB Sump Level (Ginna 2, Oconee 1, Palisades 2)

d. Fan Cooler Air Flow Indicator (Ginna 1, Oconee 0, Palisades 0)

e. Containment Pressure (Ginna 7, Oconee 4, Palisades 4)

f. LP Cooling System Heat Balance (Ginna - yes; Oconee - no; Palisades - yes)

Perhaps some of these differences can be rationalized on the basis of design differences.

DRL Position

We will verify that TMI-1 is the same as Oconee, then require Met-Ed to demonstrate that single failures (such as level switches) do not lead to unacceptable results.

For items a and c, TMI-1 should have two level switches, so as to provi reliability in the decision to place the ECCS in recirculation. Since the accumulators also have level indication, one pressure indicator is enough. Ginna has fan cooler flow indicator as an adjunct to the charcoal filter systems; TMI-1 has no filter (yet) and is acceptable without flow indicators. The four containment pressure indicators are enough. For item f, the long-term heat removal system should definitely have heat-balance capability.

6. Dilution System Controls

We understood at the CP review on TMI-1 that the dilution controls would be designed to protection system standards. Mr. Neidig of

Met-Ed so stated at the hearing. Now we are told (in answer to our Question 7.11, on p. 7-18 of FSAR) that IEEE-279 was not used in the dilution control design.

We informed Met-Ed and B & W of the obligation that they assumed at the public hearing.

The moderator dilution accident is analyzed in the FSAR, Sec. 14.1.2.4, starting on p 14-5. Conservative assumptions were used on dilution rate and boron concentration. The reactivity rate should not exceed $+1.6 \times 10^{-5}$ $\Delta K/K$ per second, which is well below the control rod group capability of 10.9×10^{-5} $\Delta K/K$ per second. Thus in automatic control no power change would be evidenced. In manual control the event would be terminated by a high pressure trip or high outlet coolant trip.

The consequences of a single failure in the dilution system appear to be acceptable, in that no safety limit is violated.

DRL Position

We accept the design change.

7. Reactor Building Spray System

We have met with the applicant and B & W on the proposed use of sodium thiosulfate. Our position, which is to accept its use subject to certain conditions, was reviewed by DRL management prior to that meeting (memo of November 6, 1970).

On another facet of the spray system, the proposed setpoint for spray actuation is 30 psig. By comparison, Oconee turns on its spray system at 10 psig (no thiosulfate).

We see no reason why the setpoint should not be 10 psig on Met-Ed. Little if any increase in the probability of spurious actuation would attend such a reduction in setpoint. On the other hand it would take a very small break, on the order of one inch or less, to create a loss-of-coolant accident that would not exceed 30 psig. [Our concern is that some LOCA might balance out less than 30 psig, due to the coolers operating properly, thus denying the redeeming features of the iodine reduction system].

DRL Position

There being no clear-cut direction for either 10 or 30, we will require 10 psig as a setpoint.

8. Hydrogen Purge System

Met-Ed proposes a purge system, with monitoring capability.

The TMI-1 exclusion radius is 2000 feet (610 meters) and the low population zone radius is 2 miles. Using the discussion paper for control of combustible gas concentration (draft dated 12/31/69), on page 11 (Table III) for the following conditions:

* Medium $\frac{\text{volume}}{\text{power}}$ ratio
* 5% metal-water reaction
* no aluminum
* 3000 mwt
* purge constantly at 4 v/o H_2
* 4-30 day meteorology
* 90% filtration efficiency for purging
* cleanup system for elemental iodine

The result from Table III is about 5 rem thyroid dose. This dose figure is only a few percent of the LOCA dose value.

DRL Position

We accept a purge system, subject to satisfactory documentation of performance of the monitoring system.

9. ATWS

We sent the ATWS letter to B & W on December 14, 1970.

DRL Position

That ATWS not be an issue on TMI-1.

10. Vibration Monitoring

We discussed in our November 24, 1970 meeting with Met-Ed the ability

of instruments that use noise analysis techniques to provide vibration/loose parts information. B & W asked for, and later got, the name of our ORNL consultant in this matter. We do not now know Met-Ed's plans.

Oconee provided, in Amendments 17, 19, and 20, details on vibration monitoring instrumentation. In Amendment 23, Duke Power agreed to explore means of using neutron noise analysis.

In the Met-Ed application, pages 13-4 and 13-4a, a brief description of confirmatory vibration tests is provided.

DRL Position

We should require a complete vibration monitoring program, not confirmatory, because

a. Oconee schedule is not fixed.

b. One test does not establish a trend.

c. By the time Oconee cold testing is complete, it may be too late to retrofit TMI-1, should that be necessary.

We could, perhaps, back off from this requirement later, if the Oconee data looks good. But it seems like two successive plants fully instrumented should be a requirement.

11. Other

Other items still outstanding on TMI-1 are:

a. Diverse ECCS Trip: Met-Ed hasn't added the RB pressure trip that Oconee added late.

b. Cold-Leg Break: B & W wants to discuss potential for buildup of solids in core due to boiloff following a cold-leg break.

c. BPRA: We haven't yet checked the integrity of the burnable poison rod assemblies.

d. Emergency Plan: Met-Ed hasn't answered the emergency plan question yet. The recent USPHS report highlighted that need.

e. Training: We need assurance that training and qualifications are in substantial compliance with ANS-3.

f. Technical Specifications: We advised Met-Ed about 1 December 1970 to go ahead and file technical specifications, as we were substantially through with Oconee. Nothing has yet been filed.

g. Structures: Since Amendment 17 is not due until late January 1971, and it contains structural answers, we can anticipate further developments in this area.