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TOLEDO EDISON

Docket No. 50-346

License No. NPF-3

Serial 1-90

September 20, 1979

Mr. James G. Keppler
Regional Director, Region III
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

Attachment A is Toledo Edison's response to IE Bulletin 79-21 for the Davis-Besse Nuclear Power Station, Unit 1, covering temperature effects on level measurements.

Very truly yours,

Richard P. Crouse
Vice President - Energy Supply

RPC/TJM

cc:
Director
Division of Reactor Operations Inspection
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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Response to IE Bulletin 79-21
Davis-Besse Nuclear Power Station
Temperature Effects on Level Measurement

Action 1. Review the liquid level measuring systems within containment to determine if the signals are used to initiate safety actions or are used to provide post-accident monitoring information. Provide a description of systems that are so employed; a description of the type of reference shall be included, i.e., open column or sealed reference leg.

RESPONSE

The liquid level measuring systems for the steam generator, pressurizer, and core flood tank have been examined. These measuring systems are of the delta pressure, open column, uninsulated reference leg type.

The pressurizer water level is monitored to provide an indication of reactor coolant inventory, to control the makeup, and is used for post-accident monitoring. The Core Flood Tank water level is monitored to provide an indication during normal operation that an adequate supply of water is available for an accident as required by Tech Specs. However, Core Flood tank level indication is not considered post-accident monitoring instrumentation. The Steam Generator water level is monitored to provide an indication and a control of the steam generator water inventory below 15% power. The level is monitored in three ranges: "Start-up", "Operating" and "Full Range". The "Start-up Range" is also used for the following safety functions:

1. Start Auxiliary Feedwater on a partial or total loss of Main Feedwater.

2. Control the water level in the unaffected Steam Generator after a steam line or feedwater line break inside the containment.

3. Control the water level in the Steam Generators after a small loss of coolant accident.

4. Post-Accident Monitoring.

Action 2. On those systems described in Item 1 above, evaluate the effect of post-accident ambient temperatures on the indicated water level to determine any change in indicated level relative to actual water level. This evaluation must include other sources of error including the effects of varying fluid pressure and flashing of reference leg to steam on the water level measurements. The results of this evaluation should be presented in a tabular form similar to Tables 1 and 2 of Enclosure 1.

RESPONSE

The effect of the reference leg temperatures on the level measurement instrumentation systems identified above is listed in Tables 1 and 2. The errors listed have been maximized to account for varying fluid pressures.

Consideration has been given to boiling in the reference leg and the ejection of water from the reference leg due to the effervescence of soluble gases.

For the core flood tanks, the level indication would be affected by elevated temperature, but the safety function of the tank is not affected by level indication, and tank discharge can be readily confirmed by pressure indication alone.

Steam generator level measurements are not significantly affected by the effervescence of soluble gases because there is insufficient soluble gas in the secondary system. For boiling to occur in the steam generator reference leg, the reference leg must experience high temperatures and almost complete depressurization.

This depressurization will not occur on both steam generators at Davis-Besse after a steam line break as the steam generators are both isolated by the Steam and Feedwater Rupture Control System and only one steam generator will be depressurized by the break. The repressurization of the steam generator will refill the reference leg and the errors would be no greater than those listed in the Tables.

The pressurizer level could be affected by the effervescence of soluble gases. The ejection of water from a reference leg has been documented in BW-4689 and previously discussed with the NRC. A depressurization from 2000 to 1000 psi will cause an error of approximately 1% or about 3.2 inches. Larger errors can exist for rapid depressurization to less than 600 psi, but under these conditions, pressurizer level is unimportant. However, supplementary instructions will be provided to make the operator aware of the possibility of pressurizer level indication errors following a rapid depressurization to pressures less than 600 psi. For boiling to occur in the reference leg, the system pressure must be below 300 psi and therefore need not be considered as discussed above.

Action 3. Review all safety and control setpoints derived from level setpoints to verify that the setpoints will initiate the action required by the plant safety analyses throughout the range of ambient temperatures. Provide a listing of these setpoints.

RESPONSE

The steam generator start-up range level is the only safety related level instrumentation inside the containment vessel which initiates safety actions at Davis-Besse. The initiating action will not be affected by partial or total loss of Main Feedwater flow as there are no temperature transients on the instrumentation resulting from this event.

These low steam generator level instruments do not provide any initiating function for main feedwater or main steam line breaks inside of containment. Low steam generator pressure switches mounted outside of containment are used to protect against these breaks inside of containment.

No reactor protection system (RPS) reactor trips are initiated by steam generator start-up range level instruments; therefore, the error induced by the increase in the reference leg temperature need only be considered for post-accident monitoring and steam generator level control. During post-accident monitoring, level indication alone is not relied upon but rather system temperature and pressures are used to assure adequate core cooling and to confirm the adequacy of the level indications. The steam generator dual level control system is used to control the speed of the auxiliary feedpumps which in turn controls the water level in the steam generators.

The highest temperature which will affect the steam generator level instrumentation will occur during a steam line break inside of containment. The unaffected steam generator would be used to remove decay heat from the Reactor Coolant system, and its start-up level instrumentation will be affected.

The water level control associated with the start-up level instrumentation is as follows:

With a "≤1600 psig Reactor Coolant Pressure" Safety Features Actuation System (SFAS) trip and no forced Reactor Coolant System circulation, the system controls the steam generator level at 120 inches of 550°F water.

Without a "≤1600 psig Reactor Coolant Pressure" SFAS trip and no forced Reactor Coolant circulation, the system controls the steam generator level at 35 inches of 550°F water.

If there is forced circulation in the Reactor Coolant System, the system controls the steam generator level at 28 inches.

Action 3 - Response (continued)

The pressurizer level instrumentation is used as Post-Accident Monitoring instrumentation and to de-energize the pressurizer heaters on low pressurizer level and therefore this level may have to be controlled manually in the event of elevated containment temperatures. The low level pressurizer heater cutout is 40 inches.

Action 4. Review and revise, as necessary, emergency procedures to include specific information obtained from the review and evaluation of Items 1, 2 and 3 to ensure that the operators are instructed on the potential for and magnitude of erroneous level signals. All tables, curves, or correction factors that would be applied to post-accident monitors should be readily available to the operator. If revisions to procedures are required, provide a completion date for the revisions and a completion date for operator training on the revisions.

RESPONSE

The Emergency Procedures which involve the steam generators start-up level, and pressurizer level will be revised as required to ensure that the operators have the instructions to be able to compensate for potentially erroneous level signals so that they can manually control these levels properly.

The necessary revisions to the procedures and the operator training on those revisions will be completed by October 31, 1979.

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TABLE 1

Correction to indicated water level for post-accident temperature effects of the steam generator operate level, steam generator full range level, pressurizer level, and core flood tank level (for tanks with water reference legs).

Reference leg temperature (°F)	Correction to indicated level (%) of full span
100	2.0
150	3.0
200	5.0
250	7.0
300	9.0
350	12.0
400	15.0

NOTE: The increase in reference leg temperature causes the measured level to indicate higher than actual level.

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TABLE 2

Correction to indicated water level for post-accident temperature effects on the steam generator start-up level.

Reference leg temperature (°F)	Correction to indicated level (%) of full span
100	2.0
150	3.0
200	5.0
250	8.5
300	12.0
350	16.5
400	21.0

NOTE: The increase in reference leg temperature causes the measured level to indicate higher than actual level.