



Commonwealth Edison

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August 8, 1979

Mr. A. Schwencer, Chief
Operating Reactors - Branch 1
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Zion Station Units 1 and 2
Additional Information on Steam
Generator Water Hammer Evaluations
NRC Docket Nos. 50-295 and 50-304

Reference (a): June 20, 1979 letter from Cordell
Reed to A. Schwencer

Dear Mr. Schwencer:

Per Reference (a), Commonwealth Edison Company indicated that it would evaluate the advisability of raising the setpoint for steam generator water level actuation in order to reduce the likelihood of steam generator water hammers. This evaluation has been completed with the conclusion that no setpoint change is warranted. The basis for this conclusion follows.

Commonwealth Edison's experience at Zion Station indicates that none of the thirteen water hammer incidents experienced over nearly six years of plant operation would have been prevented with the auxiliary feedwater initiation setpoint above the top of the feedwater ring. This is because the auxiliary feedwater flow rate is not sufficient to maintain the feedring filled with water after a reactor trip, primarily due to the rapid drainage that occurs through the existing discharge holes on the bottom of each sparger and to a lesser extent the drainage that occurs through the gap between the thermal sleeve and feedwater nozzle. However, with the installation of J-tubes these drainage holes are plugged, thus ensuring that auxiliary feedwater flow will maintain the feedring filled with water. Commonwealth Edison's experience does indicate that most, if not all, the water hammer incidents at Zion Station would not have occurred if J-tubes had been installed.

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Mr. A. Schwencer:

- 2 -

August 8, 1979

Although, to date, changes in the actuation setpoint would not have precluded any of the water hammer incidents at Zion Station, Commonwealth Edison's evaluation did indicate that raising the actuation setpoint after installation of J-tubes on all steam generators could possibly prevent future water hammer incidents in the following two situations:

1. Hot standby or low power operation in which, with automatic auxiliary feedwater flow secured, operator inattention to steam generator level results in the level dropping below the top of the feeding; and
2. Reactor trips from power ranges between 15 and 27% power may result in partial uncover of the feeding, but the water level does not fall sufficiently to automatically actuate feedwater flow.

At Zion Station, both of these situations are very low probability cases. For instance, during low power operation an operator is normally assigned full time to monitor steam generator level control, thus ensuring that the feeding remains full of water. With regard to reactor trips from power ranges between 15 and 27% power, Zion Station is normally base loaded at full-rated power and encounters the subject range only for brief periods several times a year during reactor startups to full power. In addition, Zion operating procedures require manual initiation of auxiliary feedwater flow after any reactor trip, thus ensuring that the feeding remains full of water.

For these reasons, Commonwealth Edison has concluded that raising the actuation setpoint for automatic auxiliary feedwater flow after J-tube installation has been completed is not warranted. In addition, Commonwealth Edison's evaluation also indicated that the above situations are applicable to all Model 51 Steam Generators and hence, any changes to actuation setpoints should be approached on a generic basis.

Per recent discussions with the NRC Staff, additional information concerning Zion Station water hammer history was requested. The attached Tables 1 and 2 provide the water hammer history of Zion Units 1 and 2, respectively. As Table 1 indicates,

Mr. A. Schwencer:

- 3 -

August 8, 1979

Zion Unit 1 has had five water hammers in the last eight months, primarily on the 1C Steam Generator. As a result, during the Fall 1979 refueling outage J-tubes will be installed on this steam generator. J-tubes were installed on the 2C Steam Generator of Zion Unit 2 in March 1978. The remaining steam generators will be modified as outlined in Reference (a) which also includes a discussion as to why an accelerated schedule for J-tube installation is not necessary. Note that since the installation of J-tubes on 2C Steam Generator, there have been no water hammers on Unit 2.

Please address any additional questions that you might have to this office.

Very truly yours,

Cordell Reed
Assistant Vice-President

attachments

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TABLE 1

ZION UNIT 1 WATER HAMMER HISTORY

| <u>Date</u> | <u>LER No.</u> (50-295/) | <u>Rx Trip/S.I.</u> (Time) | <u>Plant</u> <u>Condition</u> | <u>Aux. Fw.</u> <u>Flow</u> (GPM) | <u>S.G.</u> <u>Affected</u> | <u>FW Ring</u> | <u>Damage</u> | <u>Comments</u> |
|-------------|-----------------------------|-------------------------------|----------------------------------|---|--------------------------------|----------------|---------------------|--|
| 6/20/76 | 76-S-1 | 1427/1427 | 20% | N.A. | 1D | Covered | None | Aux. FW Off |
| 9/26/76 | N.A. | N.A./1801 | To CSD | N.A. | 1D | Uncovered | None | Aux. FW Off |
| 7/8/77 | 77-91 | 0033/0038 | HSD | 300 | 1C | Uncovered | None | Admin. Change to 100-105 GPM, Max. Aux. FW Per Pump |
| 9/14/78 | 78-95 | 0817/0819 | HSD | Within EOP-1 Limits | 1D | Uncovered | None | - |
| 12/5/78 | 78-130 | N.A./0150 | HSD | N.A. | 1C | N.A. | None | Cooling 1 LCV-FW520 w Condensate |
| 12/5/78 | 840 78-130 | N.A./0428 | HSD | N.A. | 1C | N.A. | None | |
| 3/2/79 | 345 79-12 | 0827/0827 | N.A. | N.A. | 1C | Uncovered | 1 MOV - FW0017* | Have Tape of Water Hammer |
| 3/16/79 | 79-19 | 0431/0524 | HSD | 150 → 200 → 100 | 1A or 1C | Uncovered | 1 MOV - FW0017** | Have Tape of Water Hammer |
| 6/8/79 | 79-44 | 0629/0645 | HSD | 150 → 200 | 1D | Uncovered | None | Have Tape of Water Hammer |

N.A. - Not Applicable

* - Cracked printed circuit board

** - Equipment found inoperable, not due to Water Hammer

TABLE 2

ZION UNIT 2 WATER HAMMER HISTORY

| <u>Date</u> | <u>LER No. (50-304/)</u> | <u>Rx Trip/S.I. (Time)</u> | <u>Plant Condition</u> | <u>Aux. FW Flow (GPM)</u> | <u>S.G. Affected</u> | <u>FW Ring</u> | <u>Damage</u> | <u>Comments</u> |
|-------------|-------------------------------------|--------------------------------|----------------------------|-----------------------------------|------------------------------|----------------|---------------|--|
| 12/30/74 | 3/7/75 letter to J.G. Keppler | 1357/1424 | HSD | N.A. | Suspected Water Hammer | Uncovered | None | First Docu- mented Water Hammer/S.I. |
| 5/25/76 | 76-S-1 | 1053/1129 | HSD | 100 | 2C | Uncovered | None | High Δp on B&D Loops |
| 6/20/76 | 76-S-3 | 0103/0205 | HSD | N.A. | 2C | Uncovered | None | - |
| 7/10/77 | 77-S-3 | 1121/1149 | HSD | N.A. | 2C | Uncovered | MOVs | Occurred when FW0016, main FW by- 17, 13** pass opened |

N.A. - Not Applicable

** - Equipment found inoperable, not due to Water Hammer

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