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July 13, 1979
GQL 0883

Director of Nuclear Reactor Regulation
Attn: R. W. Reid, Chief
Operating Reactors Branch No. 4
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Sir:

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Operating License No. I R-50
Docket No. 50-289
Feedwater Line Cracking

Your letter of May 23, 1979 concerning feedwater line cracking included a group of questions headed, "Preservice/Inservice Inspection and Operating History". Attached please find our responses to those questions.

As indicated in our letter of June 26, 1979 (GQL 0807), certain details of feedwater header and nozzle weld procedures are being assembled by Babcock & Wilcox and will be supplied by July 27, 1979.

Sincerely,

J. G. Herbein
Vice President
Generation

JGH:WSS:mrm
Attachment

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July 13, 1979
GQL 0883

Three Mile Island Nuclear Station, Unit 1 (TMI-1)
Docket No. 50-289
Feedwater Line Cracking Information

Preservice/Inservice Inspection and Operating History

1. State whether the feedwater system welds received a preservice inspection in accordance with ASME B&PV Code, Section XI.

   Answer: No Section XI baseline was done.

2. Provide the extent of inservice inspection performed on the feedwater pipe to steam generator nozzle welds. Include the results of the examinations, any corrective actions taken and causes of any failures.

   Answer: To date only two welds in the feedwater system piping (FW-W1 and -W2) have been examined per ASME B&PV Code, Section XI, but these examinations were not accepted due to discrepancies discovered in the data. See also the answer to (3) below.

3. Provide the schedule and extent of inservice inspection for the feedwater system for the next inspection interval.

   Answer: FW-W1 and -W2 will be re-examined at the next refueling outage. FW-W49 will be examined in the 3rd ASME Section XI inspection period which will commence on April 2, 1981 and last 3 1/3 years.

   Eighteen feedwater system piping circumferential butt welds will be examined over the life of the plant.

4. Provide any history of water hammer or vibration in the feedwater system and design changes and/or actions taken to prevent these occurrences.

   Answer: Unit 1 has never had a history of any noticeable vibration or water hammer within the feedwater system.

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5. Provide a description of feedwater chemistry controls and a summary of chemistry data.

Answer: TMI utilizes an all-volatile treatment (AVT) scheme for chemistry control of the feedwater system as prescribed by B&W. Additionally, 100% condensate polishing via a powdered ion exchange resin system is employed. Operational limits for chemistry parameters are as follows:

Max Total Solids (dissolved & suspended), ppb	50
Max Cation Conductivity, μmho/cm	0.5
Max dissolved oxygen, ppb	7
Max total silica (as SiO_2), ppb	20
Max total iron (as Fe), ppb	10
Max total copper (as Cu), ppb	2
pH at 77°F (adjusted with ammonia)	9.3 - 9.5
Total hardness	(a)
Organics	(b)
Lead	(c)
Hydrazine, ppb	20 - 100(d)
Ammonia, ppm	0.7 - 1.5
Sodium	(e)

(a) No specification due to control analysis limitations. However, care is taken to eliminate hardness constituents due to possible steam generator deposition problems.

(b) Organic contamination avoided to prevent possible resin fouling.

(c) Lead concentrations in feedwater maintained below detectable limits to prevent possible problems with Inconel 600 in the once-through steam generators (OTSG s).

(d) Hydrazine is added to the feedwater based on oxygen concentrations. Enough hydrazine is added to react with 300% of the stoichiometric oxygen content with residual of 20 to 100 ppb after the final feedwater heater.

(e) B&W specifications do not list sodium. However, they do mention that it should be monitored and that the measured results should be related to the specified total solids limit of 50 ppb (max.). Also, GE turbine specs require a steam purity of less than 3 ppb sodium and this is applied to the TMI feedwater.

Key parameters from the above list of specifications are monitored continuously with on-line analyzers. These include cation conductivity, pH, sodium, dissolved oxygen, and hydrazine. The analyzers have alarm functions in the Control Room.

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Operational procedures conservatively require that the reactor be brought to hot shutdown if feedwater cation conductivity exceeds 0.5 µmhos/cm.

A program of routinely returning some of the mositure separator drain flow to the condenser has also been incorporated. This has led to improved feedwater quality.

Typical feedwater quality during operation is as follows:

pH	9.3 - 9.5
Cation Conductivity	< 0.2 µmhos/cm
Sodium	< 2 ppb
Dissolved Oxygen	< 2 ppb
Silica	< 5 ppb
Hydrazine	40 ppb residual
Iron	< 10 ppb
Chlorides	< 5 ppb
Copper	< 1 ppb
Lead	< 1 ppb
Ammonia	0.7 - 1.5 ppm

During periods of startup from cold shutdown conditions, the condensate system is recirculated through the polishers, vacuum is established and heat is applied so that the water meets the following B&W specifications prior to feeding the OTSG's:

Cation Conductivity	< 1.0 µmho/cm & must be < 0.5 µmho/cm within 24 hours
Dissolved Oxygen	< 100 ppb & must be < 7 ppb within 8 hours
Total Iron	< 100 ppb and decreasing trend must be established.
Hydrazine	300% of stoichiometric oxygen concentration plus 20-100 ppb residual.