



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 25, 2011

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 - REQUEST FOR
ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST
PROPOSING CHANGES TO THE NUMBER OF REQUIRED OPERABLE MAIN
STEAM SAFETY VALVES (TAC NO. ME4808)

Dear Mr. Pacilio:

By letter dated September 24, 2010 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML102780570), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request proposing to revise the Technical Specifications (TSs) for Three Mile Island Nuclear Station, Unit 1. The proposed changes would modify TS 3.4.1.2.3 regarding the number of main steam safety valves required to be operable as a function of power level.

The Nuclear Regulatory Commission staff has been reviewing the response and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The questions were sent via electronic transmission on March 2, 2011, to Ms. Wendi Croft, of your staff. The draft questions were sent to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed. The draft questions were discussed in a meeting with your staff on March 14, 2011. Based on the outcome of the meeting, questions 2, 3, and 4 were slightly modified. It was agreed that a response to this RAI would be submitted by April 22, 2011.

Please contact me at 301-415-2833, if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "Peter Bamford".

Peter Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure:
As stated

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REQUEST FOR ADDITIONAL INFORMATION
THREE MILE ISLAND NUCLEAR STATION, UNIT 1
PROPOSED TECHNICAL SPECIFICATION CHANGES REGARDING
MAIN STEAM SAFETY VALVES
DOCKET NO. 50-289

By letter dated September 24, 2010 (Agencywide Documents Access and Management System Accession No. ML102780570), Exelon Generation Company, LLC (the licensee), submitted a license amendment request (LAR) for Three Mile Island Nuclear Station, Unit 1 (TMI-1). The licensee proposes to revise Technical Specification (TS) 3.4.1.2.3 to allow up to two Main Steam Safety Valves (MSSVs) per steam generator to be inoperable with no required reduction in power level. The LAR would also revise the required maximum overpower trip setpoints for any additional inoperable MSSVs. In order for the Nuclear Regulatory Commission (NRC) staff to complete its review of the LAR, a response to the following request for additional information is requested.

1. In the LAR the licensee states, "The design capacity of the MSSVs is based on the ASME [American Society of Mechanical Engineers Boiler and Pressure Vessel] Code, Section III." Section 10.3.1.1 of the TMI-1 Updated Final Safety Analysis Report (UFSAR), states, "Safety valves on the main steam lines and branches to the emergency feedwater turbine are designed in accordance with ASME Code Section III, Class A requirements." Further, UFSAR Section 10.7.4, "Overpressure Protection," refers to ASME Section III, 1989 edition for the determination of MSSV set pressures. The ASME Code, Section III, Paragraph NC-7410, "Set Pressure Limitations for Upset Conditions," states, "the stamped set pressure of at least one of the pressure relief devices [MSSVs] connected to the system shall not be greater than the design pressure of any component within the pressure retaining boundary of the protected system."

In the LAR, the licensee is requesting to revise TMI-1 TS 3.4.1.2.3 to allow TMI-1 to operate at full power with seven of the nine MSSVs operable per steam generator and at reduced power level with up to five MSSVs inoperable per steam generator. In Attachment 3 of the LAR, Section 7.0, the licensee provides suggested changes to TS 3.4.1.2.3, as determined by the AREVA analyses which is included in the LAR, based on the number of inoperable MSSVs. The AREVA analysis includes a proposed conditional statement to ensure that the TS revision for TMI-1 would continue to meet the requirements of ASME Section III, NC-7410.

The proposed TS revision in the LAR does not include this conditional statement. The licensee states, "TMI has not adopted the suggested change in 86-9054640-002 - Section 7.0, which states, "At least one (1) OPERABLE MSSV on each steam generator must have a nominal lift setpoint ≤ 1050 [pounds per square inch gauge or psig]." The reason provided in the application is, in part, that the main steam piping is designed to [United States of America Standard or USAS] B31.1 and that there is no requirement for B31.1 piping to have at least one safety valve set at, or below, the piping design pressure.

Enclosure

The NRC staff requests that the licensee explain in more detail why the AREVA recommendation was not included in the application. This explanation should specifically address the requirements for the ASME Section III designed branches to the emergency feedwater pump turbine, as well as the ASME Section III design code for the MSSVs themselves, as described in the UFSAR. Also, the staff requests that the licensee provide a basis for the acceptance criteria that peak steam line pressure remains below 110 percent (%) of 1050 psig.

2. Attachment 3 of the LAR provides the AREVA analyses for all of the scenarios involving certain MSSVs inoperable at various power levels. The NRC staff requests that the licensee identify the basis for, and assumptions used, in the analysis for drift tolerance for each of the MSSV pressure setpoints. Also, the staff requests a description of the valves' accumulation behavior as illustrated in Figures 4-16 through 4-19, and clarify whether valve lift setpoint uncertainty and valve accumulation uncertainty are considered independently.
3. In Section 4.1 of Attachment 3 in the LAR, AREVA provides an analysis of allowing TMI-1 upset condition (turbine trip) at full power (100% with a 2% uncertainty, hence 102%) with two MSSVs out of service. The licensee indicates that the most limiting condition occurs on steam generator 'B' steam line 4, with the following two MSSVs out of service: MS-V17D and MS-V20D, each with lift setpoint pressures of 1050 psig. On Figure 4-13, AREVA shows the maximum pressures reached in the main steam lines were 1159.06 psia [pounds per square inch absolute] (1144.36 psig), in steam lines 3 and 4, and approximately 1140 psia (1125.3 psig), in steam lines 1 and 2. Also, in Figure 4-13, the maximum steam line pressure for all four steam lines appear to exceed 1115 psia (1100 psig) prior to 3 seconds during the turbine trip transient.

Regarding Figures 4-16, 4-17, and 4-18, MS-V19A with a setpoint of 1080 psig on steam line 1; MS-V20B with a setpoint of 1092.5 psig on steam line 2; and MS-V20C with a setpoint of 1092.5 psig on steam line 3, respectively, are depicted as not lifting in response to the turbine trip transient when the maximum pressures for steam lines 1, 2 and 3 are reached. Additionally on Figures 4-16 through 4-19, the following MSSVs are depicted as lifting well after 3 seconds into the transient:

- MS-V18A with a setpoint of 1060 psig on steam line 1
- MS-V18B with a setpoint of 1060 psig and MS-V19B with a setpoint of 1080 psig on steam line 2
- MS-V18C with a setpoint of 1060 psig and MS-V19C with a setpoint of 1080 psig on steam line 3
- MS-V18D with a setpoint of 1060 psig on steam line 4

Figure 4-13 appears to contradict Figures 4-16 through 4-19 in regards to the time in which the MSSVs actuate during the transient.

The NRC staff requests that:

- a. The licensee clarify whether MSSVs MS-V19A, MS-V20B, and MS-V20C open in response to the maximum steam line pressures exceeding the

safety valves' setpoints during a turbine trip transient.

- b. The licensee clarify the times in which the other MSSVs, as described above, lift open in comparison to the pressure in each steam line during the turbine trip transient.
 - c. For the limiting case, steam generator exit pressure is provided in Figure 4-13. The NRC staff requests a plot showing the pressure in the control volume for each steam line representing the pressure at the safety valves, and the parameters used to derive these values.
 - d. Please provide a nodalization diagram of the main steam system, indicating the location of each safety valve.
4. Section NC-7511 of the ASME Section III Code states that the total rated relieving capacity shall be sufficient to prevent a rise in pressure of more than 10% above the design pressure of any component with the pressure retaining boundary of the protected system under any system upset conditions. In the TMI-1 LAR, the licensee states that the design capacity for the MSSVs is sufficient to limit secondary system pressure to less than or equal to 110% of design pressure when passing 100% of design steam flow. The main steam line design pressure for TMI-1 is 1050 psig (1064.7 psia); hence 110% of design pressure is 1155 psig (1169.7 psia).

In Section 4.1 of Attachment 3 in the LAR, AREVA provides an analysis of allowing TMI-1 upset condition (turbine trip) at full power with two MSSVs out of service. The licensee indicates that the most limiting condition occurs on steam generator 'B' steam line 4, where the MS-V17D and MS-V20D MSSVs are located, each with lift setpoint pressures of 1050 psig (1064.7 psia). The analysis shows the maximum steam line pressure does not exceed the limit of 1169.7 psia.

The AREVA analysis in Section 4.2 of Attachment 3 provides the results of three MSSVs (MS-V17D, MS-V18D, and MS-V20D) being inoperable in steam line 4 at full power. The analysis determines that this condition would exceed the maximum allowable steam line pressure limit of 1169.7 psia.

However, the NRC staff postulates that a more limiting condition could possibly exist with MS-V17B and MS-V18B MSSVs inoperable on steam line 2. Figure 4-17 in Attachment 3 depicts MSSV MS-V20B (setpoint of 1092.5 psig) not lifting during the transient. Based on AREVA's method of making the two lowest MSSVs in the steam line inoperable, the remaining relief capability on steam line 2 may be less than that of steam line 4 determined by AREVA as the most limiting case. Therefore, in comparison to the analysis in Section 4.2 showing only one MSSV lifting (MS-V19B lifts with a setpoint of 1080 psig) on steam line 2, the maximum pressure reached could exceed the allowable steam line pressure limit at full power.

Therefore, the NRC staff requests that the licensee provide the results of the sensitivity study, as well as the inputs and assumptions, used to determine how the MS-V17D and MS-V20D MSSVs were selected as the most limiting case for the turbine trip transient.

5. In Attachment 3 of the LAR, Section 5.3 evaluated a plant condition with four MSSVs inoperable at 62% power level. However, Table 4 in the proposed LAR shows in the "Analyzed Power Level (% of 2772 MWt)" column that TMI-1 can operate at a power level of 77% with four MSSVs per steam generator inoperable. In Section 5.5 of the AREVA report included with the application, the 77% case is discussed, referring to a separate AREVA analysis, which is not included in the application. The NRC staff requests that the licensee provide the analysis of four MSSVs inoperable per steam generator at 77% power for confirmation that the analysis supports the requested TS changes.

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President and Chief Nuclear Officer
Exelon Nuclear
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/ra/

Peter Bamford, Project Manager
Plant Licensing Branch I-2
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