
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 464-8575
SRP Section: 10.03 – Main Steam Supply System
Application Section: 10.3
Date of RAI Issue: 04/19/2016

Question No. 10.03-6

Conformance to GDC 4, as related to environmental and dynamic effects, requires that the safety-related portions of the main steam supply system (MSSS) design adequately consider water (steam) hammer and relief valve discharge loads to assure that system safety functions can be performed and assures that operating and maintenance procedures include adequate precautions to prevent water (steam) hammer and relief valve discharge loads.

On October 28, 2015, KHNP provided its response to RAI 8053, Question 10.03-1, related to the development of procedures to address water (steam) hammer. The staff reviewed such response and finds it to be unacceptable. Specifically, RAI 8053, Question 10.03-1 requested the applicant to list the items to be incorporated into operating and maintenance procedures consistent with NUREG-0927. As a result, the applicant removed existing text from COL item 10.3(1), and did not include the requested information.

This supplemental RAI requests the applicant to include in DCD Tier 2, Section 10.3.2.3.5, the complete list of items to be incorporated into operating and maintenance procedures necessary to address water (steam) hammer. The type of information and level of detail needed for the staff to complete its review is similar to the information already included in DCD Tier 2, Section 10.4.7.6.

Response

Operating and maintenance procedures necessary to address water (steam) hammer specified in NUREG-0927 will be included in DCD Tier 2, Section 10.3.2.3.5.

Impact on DCD

DCD Tier 2, Subsection 10.3.2.3.5 will be revised as indicated on the attached markup.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

APR1400 DCD TIER 2

RAI 122-8053 - Question 10.03-1

RAI 464-8575 - Question 10.03-6

For an evaluation of a main steam line break (MSLB) and steam generator tube rupture (SGTR), refer to Section 15.0.

10.3.2.3.5 Water (Steam) Hammer Prevention

The MSS is designed to minimize the potential for steam hammer. The MSS is designed to accommodate steam hammer dynamic loads and relief valve discharge loads resulting from the rapid closure of system valves and safety/relief valve operation without compromising safety functions. Refer to Section 3.12 for a description of piping design and piping supports design. Loads from relief valve openings and sudden closure of valves are included in the piping analyses.

The MSS design includes protection against water entrainment, which includes provisions for drain pots, line sloping, and valve operation. The main steam nozzle vertical connection lines of the SGs are the highest point in the main steam piping and all main steam lines slope away from the SGs.

Low-point drains are provided on the main steam pipes for startup and for prevention of turbine water induction and water hammer. Main steam drain valves are provided with position indications. Main steam drain valves can be manually controlled in the MCR and RSR. Main steam drain valves are automatically opened and closed by drip pot level switches. Level alarms are provided in the MCR and RSR to warn the operator of main steam line drain pot high-high level.

The discharge piping from the TBVs to the condenser is arranged without low points or includes drains to prevent water from collecting in the piping. The discharge piping from each valve is not headered together prior to its connection to the condenser. These precautions will eliminate potential water hammer damage to condenser internals and other TBVs upon valve opening.

The COL applicant is to provide operating and maintenance procedures including adequate precautions to prevent water (steam) hammer and relief valve discharge loads and water entrainment effects in accordance with NUREG-0927 and a milestone schedule for implementation of the procedure (COL 10.3(1)).

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The COL applicant is to provide operating and maintenance procedures in accordance with NUREG-0927 and a milestone schedule for implementation of the procedure (COL 10.3(1)). The procedures are to address :

- a. Prevention of rapid valve motion
- b. Introduction of voids into water-filled lines and components
- c. Proper filling and venting of water-filled lines and components
- d. Introduction of steam or heated water that can flash into water-filled lines and components
- e. Introduction of water into steam-filled lines or components
- f. Proper warmup of steam-filled lines
- g. Proper drainage of steam-filled lines
- h. Effects of valve alignments on line conditions