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.:	**463-8570**
SRP Section:	**10.3 – Main Steam Supply System**
Application Section:	**10.3**
Date of RAI Issue:	**04/19/2016**

Question No. 10.03-5

GDC 4 requires that SSCs important to safety are designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. GDC 34 requires the portions of the main steam system (MSS) associated with residual heat removal function to transfer heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded. SRP 10.3 provides guidance and acceptance criteria to meet relevant requirements associated with the MSS.

The staff reviewed DCD Tier 2, Section 10.3, for a description of all flowpaths that branch off the main steamlines between the main steam isolation valves (MSIVs) and turbine stop valves as specified in SRP 10.3, Section III.5.E. The staff determined that this information is either incomplete or missing from the application.

The applicant is requested to include in the DCD a complete tabulation and description of all flowpaths between the MSIVs and turbine stop valves, including shutoff valves in connected piping, and bypass valves. The type of information and level of detail needed for the staff to complete its review is listed in item i through ix of SRP 10.3, Section III.5.E.

Response

A new table including information required in SRP 10.3, Section III.5.E will be added in the DCD Tier 2, Subsection 10.3.2.2.1.

The table format was based on the similar table provided in other DCDs. The maximum steam flow is determined based on the VWO(Valve Wide Open) condition. The valves in flow paths branched to main steam line between the MSIVs and turbine stop valves are applied to identical quality and design code. Because they are located in auxiliary building or turbine generator building outside main steam valve house and non-safety components. Therefore, quality and

design code are skipped from the table in order to avoid duplication because they are described in DCD Tier 2, Subsection 3.2, Table 3.2-1.

Impact on DCD

DCD Tier 2, Subsection 10.3.2.2.1 will be revised and Table 10.3.2-6 will be added 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 Technical Specifications.

Impact on Technical/Topical/Environmental Reports

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

Upstream of the main steam isolation valves, there are connections for the main steam atmosphere dump valves, main steam safety valves, low point drains, nitrogen supply, auxiliary feedwater pump turbine steam supply. Branch piping downstream of the main steam isolation valves includes connections for the turbine bypass, 2nd stage reheaters, high pressure turbine, feedwater pump turbine, auxiliary steam, turbine steam seal and low point drains. Table 10.3.2-6 describes branch piping, 2.5 inches and larger, that is downstream of the main steam isolation valves up to turbine stop valves.

10.3.2.2 Component Description

10.3.2.2.1 Piping

The MSS delivers steam from the two SGs to the HP turbine during normal power operation. The MSS has four main steam lines from the two SGs to the main steam common header. The four main steam lines are designed so that the pressure drop between SG nozzle and turbine stop valve does not exceed 2.1 kg/cm^2 (30 psi) at 105 percent of saturated steam flow at normal full-power SG pressure. The main steam lines are arranged so that pressure drops between each SG and the main steam header are approximately equal. The difference between steam line pressure drops is within 0.2 kg/cm^2 (3 psi) at the full-power condition. The piping diameter is determined to limit velocities, taking account of erosion and corrosion effects. Main steam piping layout is designed so that 90-degree elbows and miters are minimized.

The main steam piping and its supports and restraints are designed to withstand loads under the service levels specified in Subsection 3.9.3.

Sampling connections are provided downstream of the MSIVs to monitor the steam chemistry. Low-point drains are provided on the main steam piping for startup operation and for prevention of turbine water induction. Condensate from the low point is drained to the main condenser.

Adequate clearances are provided for inservice inspection of the ASME Section III, Class 2 portions of the MSS piping in accordance with ASME Section XI.

Piping design data are provided in Tables 10.3.2-2 and 10.3.2-3.

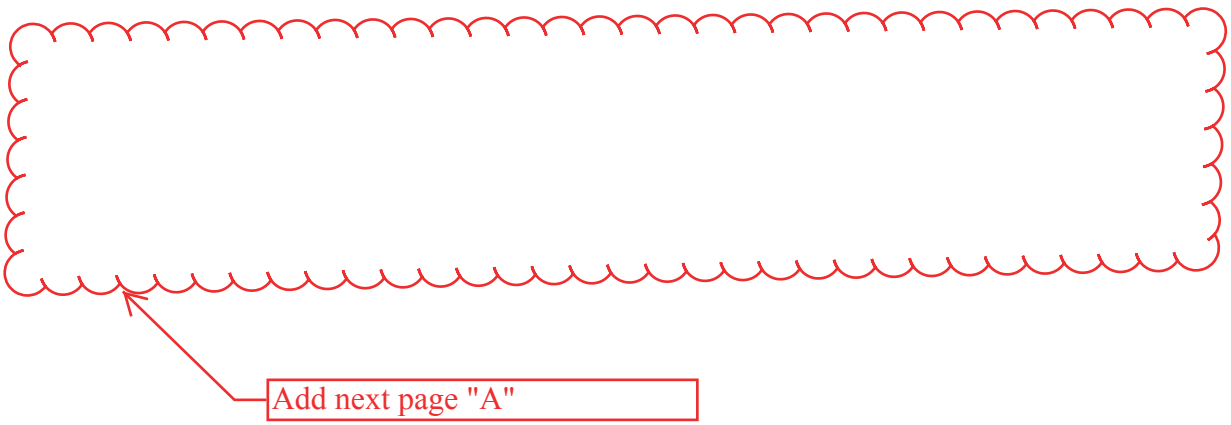
10.3.2.2.2 Main Steam Isolation Valve and Main Steam Isolation Valve Bypass Valve

Each main steam line has an MSIV to maintain tight shutoff against forward and reverse steam flow under its design condition. Each MSIV is provided with a bypass line for warmup of the steam lines downstream of the isolation valves and pressure equalization prior to admitting steam to the turbine.

Table 10.3.2-5

Main Steam and Feedwater Piping Fluid Data

Segment	Fluid	Flow Rate kg/hr (lb/hr)	Temperature ºC (ºF)	Pressure kg/cm²A(psia)
Main steam piping ASME Class 2	Steam	8.14×10^6 (17.95×10^6)	284.2 (543.6)	69.75 (992)
Feedwater piping ASME Class 2	Water	8.16×10^6 (17.99×10^6)	232.2 (450.0)	74.17 (1,055)



A

Table 10.3.2-6

Main Steam Branch Piping (2.5 Inches and Larger), Between the MSIVs and the Turbine Stop Valves

Description	Max. Steam Flow	Shutoff Valve	Valve Closure Time	Actuator	Comments
Turbine bypass lines to condenser ; 8 lines total	1,292,000 lb/hr (162.79 kg/s), each lines	16 in (406.4 mm) globe (turbine bypass valve)	within 5 sec when the permissive signal from the SBCS	Air operated ; Fail close	Valves are normally closed during power operation
Reheating steam 2nd stage to MSRs ; 2 lines total	413,500 lb/hr (52.1 kg/s), each lines	12 in (304. 8mm) Gate (isolation valve)	[[Max. 49 sec]][1)]	Motor operated ; Jogging/Fail-As-Is	Flow to reheater ceases following turbine trip flow ceases following valve closure on a main steam isolation signal
Main steam supply to auxiliary steam system. ; 1 line High	476,000 lb/hr (59.975 kg/s)	10 in (254 mm) globe (isolation valve)	[[Max. 60 sec]][1)]	Motor operated ; Fail-As-Is	This line is normally open during power operation.
pressure turbine steam supply lines ; 4 lines total	4,504,000 lb/hr (567.49 kg/s), each lines	32 in (812.8 mm) gate (HP turbine stop valve)	0.3 sec	Electro-Hydraulic operated, Fail close Motor operated ;	Main steam flow to high pressure turbine ceases following stop valve closure on a turbine trip
Main steam supply for turbine steam seal ; 1 line	38,987 lb/hr (4.91 kg/s)	4 in (101.6 mm) gate (isolation valve)	[[-]][1)]	Fail-As-Is	This line is normally open during power operation.
Main steam supply to feedwater pump turbine , 3 lines	146,287 lb/hr (18.43 kg/s), each lines	6 in gate (H.P. steam inlet stop valve)	[[-]][1)]	Electro-Hydraulic operated, Fail close	Flow ceases after receipt of main steam isolation signal

1) Value determined by valve supplier