
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.: 467-8394
SRP Section: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation
Application Section: -
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Question No. 19-103

SRM on SECY-93-087 states the following: The Commission approves the staff's recommendation that the applicant for design certification for a passive or evolutionary PWR assess design features to mitigate the amount of containment bypass leakage that could result from steam generator tube ruptures.

SECY-93-087 states the following:

The staff concludes that containment bypass resulting from SGTRs can be a significant challenge to containment integrity. Therefore, the staff concludes that the plant designer should consider design features that would reduce or eliminate containment bypass leakage in such a scenario. The following features could mitigate the releases associated with a tube rupture:

- a highly reliable (closed loop) steam generator shell-side heat removal system that relies on natural circulation and stored water sources;
- a system which returns some of the discharge from the steam generator relief valve back to the primary containment; or,
- increased pressure capacity on the steam generator shell side with a corresponding increase in the safety valve setpoints.

Describe APR1400 design features that could mitigate the releases associated with a tube rupture and update the DCD as necessary.

Response

Operator actions following an SGTR event normally include minimization of the break flow rate and control of primary and secondary pressures and levels by using plant components and systems according to the action steps of Emergency Operating Procedure (EOP).

The operator cools the primary system to prevent lifting the MSSVs using the steam bypass control system (SBCS). The SBCS is an automatic system which provides a path to remove steam from the steam generators. In the event of SGTR, the SBCS will automatically relieve secondary pressure and dump steam to the condenser. This system will regulate the pressure in the secondary system below the MSSV setpoint and remains effective until a main steam isolation signal (MSIS) is generated on high steam generator level.

The operator has a variety of choices available in the APR1400 design to reduce RCS pressure. They include operation of main or auxiliary spray pressurizer, operation of charging and letdown, throttling of the safety injection pumps, and the RCS depressurization function of the RCGVS. After identifying the affected SG, operator isolates the affected steam generator. If the SBCS is inoperative, the operator cools and depressurizes the RCS using the ADVs and the auxiliary feedwater on the unaffected steam generator. Following isolation of the affected SG, the operator continually monitors steam generator level to prevent overfilling the isolation SG and the isolated steam generator pressure to ensure it is below the MSSV setpoint.

In the event of a multiple steam generator tube rupture (MSGTR) that is beyond the design basis accident, the operator can actuate emergency blowdown (EBD) to reduce the SG water level using the periodical high-capacity blowdown (HCBD) valve and piping. The SG blowdown system (SGBDS) is designed to assist in maintaining the chemical characteristics of the secondary side water within permissible limits during normal operation and anticipated operational occurrences (AOOs) such as a main condenser tube leak or SG primary-to-secondary tube leakage. The SGBDS is also designed to remove impurities concentrated in SGs by continuous blowdown (CBD), HCBD, and EBD.

A detailed description of the SGBD system and operator action for SGTR is included in DCD section 10.4.8 and 15.6.3, respectively.

Impact on DCD

There is no impact on the DCD.

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.