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.:	**395-8478**
SRP Section:	**15.06.01 - Inadvertent Opening of a PWR Pressurizer Pressure Relief Valve or a BWR Pressure Relief Valve**
Application Section:	**15.06.01**
Date of RAI Issue:	**02/03/2016**

Question No. 15.06.01-2

General Design Criteria (GDC) 10 requires that specified acceptable fuel design limits (SAFDLs) are not exceeded during an anticipated operational occurrence (AOO). 10 CFR 52.47(a)(9) requires that applicants for light-water cooled nuclear power plants provide an evaluation of the standard plant design against the standard review plan (SRP) revision in effect 6 months before the docket date of the application. Where a difference exists, the evaluation shall discuss how the proposed alternative provides an acceptable method of complying with the Commission's regulations that underlie the corresponding SRP section.

NRC staff issued RAI 170-8163 during the review of Section 15.6.1 of the APR1400 Design Control Document (DCD). In RAI 170-8163, NRC staff questioned the treatment of the inadvertent opening of a pressurizer relief valve (IOPRV) event as a postulated accident instead of an anticipated operational occurrence (AOO) as specified in the SRP. Additionally, Table 1.9-2 of the DCD states that the APR1400 conforms to SRP Section 15.6.1. Classifying the IOPRV event as a postulated accident results in a significant difference from the SRP acceptance criteria. Therefore, Table 1.9-2 of the DCD is currently incorrect and further justification in Section 15.6.1 of the DCD is required per 10 CFR 52.47(a)(9).

The KHNP response to RAI 170-8163 did not alleviate NRC staff concerns because:

1. The RAI response contained no DCD update to correct Table 1.9-2.
2. The RAI response contained no DCD update to provide justification for treating the IOPRV event as a postulated accident.
3. The RAI response contains insufficient justification for treating the IOPRV event as a postulated accident. The RAI response states, "… the main valve would be able to operate by opening double motor operated pilot valves for the rapid depressurization function of reactor coolant system when a total loss of feedwater event occurs. Therefore, there is no need to consider an operator error for the POSRV because this valve is fully automatic, while the PORV has the tendency of an operator error identified in SRP. Consequently, the scenarios identified in the SRP are not applicable to the APR1400

design.” NRC staff understands that the overpressure protection function of the pilot operated safety relief valves (POSRVs) is fully automatic and passive. NRC staff’s concern is in regard to the double motor operated pilot valves which can be manually operated from the control room. The RAI response does not address the potential for a spurious electrical signal or operator error, in regards to the operation of the double motor operated pilot valves, which would lead to an IOPRV event.

NRC staff requests that KHNP update Section 15.6.1 of the DCD with justification for stating that a spurious electrical signal or operator error is not applicable to the APR1400. If sufficient justification is not available, Section 15.6.1 of the DCD will need to be updated with an appropriate analysis to demonstrate compliance with the Commission’s regulations that underlie SRP Section 15.6.1. Additionally, Table 1.9-2 of the DCD needs to be updated accordingly.

Response

1. Table 1.9-2 (30 of 33) will be updated based on the response to items 2 and 3.

2. As shown in Response to item 3, a spurious electrical signal or operator error, in regards to the operation of the double motor operated pilot valves is not applicable to the APR1400. Only the failure of a spring loaded pilot valve (SLPV) is a cause of the IOPOSRV event, however, the SLPV has the same characteristic as a PSV. This characteristic will make the IOPOSRV event as the IOPSV event which is regarded as a SBLOCA. Therefore, it is reasonalbe to treat the IOPOSRV event as a postulated accident.

3. The POSRVs perform both the overpressure protection function and the rapid depressurization function. The spring loaded pilot valve and the main valve in the POSRV perform the overpressure protection function using the passive hydraulic mechanism. Whereas, the motor operated pilot valves and the main valve in the POSRV perform the rapid depressurization function using the manual operation during the feed and bleed operation in a total loss of feedwater event. A schematic diagram of the POSRV is shown in Figure 1.

   To prevent POSRVs from opening due to a spurious electrical signal or operator error, one of the two motor operated pilot valves is designed to be powered off during the normal operation as is described in DCD TIER 2, Chapter 16 Tech. Spec., Section 3.4.10 Pressurizer Pilot Operated Safety Relief Valves (POSRVs), SR 3.4.10.2.

   Based on the above, the justification for stating that a spurious electrical signal or operator error is not applicable to the APR1400 will be added to Section 15.6.1.

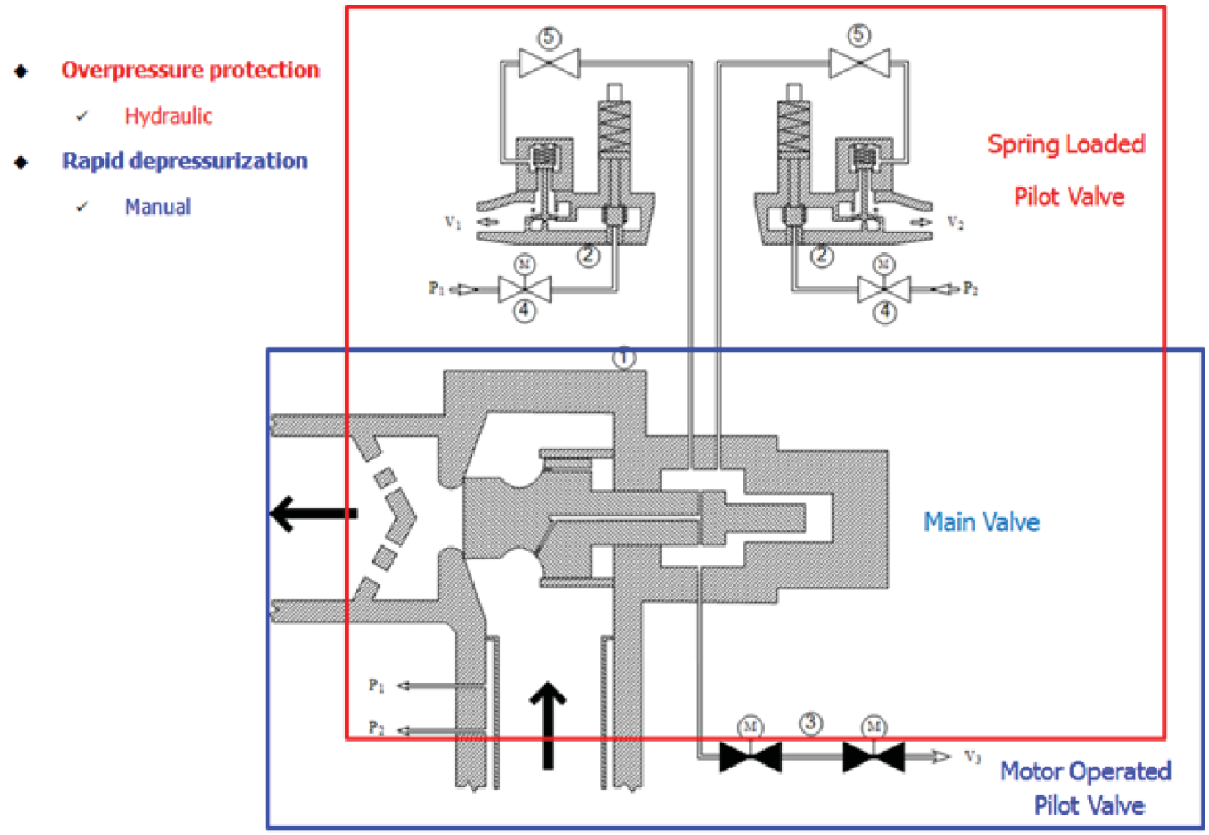

Figure 1 POSRV Schematic Diagram

Impact on DCD

DCD Table 1.9-2 and Chapter 15.6.1 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 Environment Report.

Table 1.9-2 (30 of 33)

SRP Section/Title	Revision / Issue Date	Conformance or Summary Description of Deviation	DCD Tier 2 Section
15.4.9 – Spectrum of Rod Drop Accidents (BWR)	Rev. 3 03/2007	Not applicable (BWR)	N/A
15.4.9.A – Radiological Consequences of Control Rod Drop Accident (BWR)	Rev. 2 07/1981	Not applicable (BWR)	N/A
15.5.1-15.5.2 – Inadvertent Operation of ECCS and Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory	Rev. 2 03/2007	The APR1400 conforms with this SRP.	15.5.1, 15.5.2
15.6.1 – Inadvertent Opening of a PWR Pressurizer Pressure Relief Valve or a BWR Pressure Relief Valve	Rev. 2 03/2007	~~The APR1400 conforms with this SRP.~~	15.6.1
15.6.2 – Radiological Consequences of the Failure of Small Lines Carrying Primary Coolant Outside Containment	Rev. 2 07/1981	Not applicable. SRP 15.0.3, "Design Basis Accident Radiological Consequence Analyses for Advanced Light Water Reactors," is applied instead of SRP 15.6.2.	15.0.3
15.6.3 – Radiological Consequences of Steam Generator Tube Failure	Rev. 2 07/1981	Not applicable. SRP 15.0.3, "Design Basis Accident Radiological Consequence Analyses for Advanced Light Water Reactors," is applied instead of SRP 15.6.3.	15.0.3
15.6.4 – Radiological Consequences of Main Steam Line Failure Outside Containment (BWR)	Rev. 2 07/1981	Not applicable (BWR)	N/A

Not applicable.
This SRP applies to plants adopting Pressurizer Pressure Relief Valve instead of Pressurizer Pilot Operated Safety Relief Valve.

15.6 Decrease in Reactor Coolant Inventory

This section describes the analyses that have been performed for events that could result in a decrease in reactor coolant inventory, which can lead to a temperature increase in the reactor coolant system (RCS).

Several anticipated operational occurrences (AOOs) and postulated accidents (PAs) can cause a decrease in reactor coolant inventory. Detailed analyses of these reactor coolant inventory events are described in the following subsections:

a. Subsection 15.6.1 – Inadvertent opening of a pressurizer pressure relief valve

b. Subsection 15.6.2 – Failure of small lines carrying primary coolant outside the containment

c. Subsection 15.6.3 – Steam generator tube failure

d. Subsection 15.6.4 – Radiological consequences of main steam line failure outside the containment for a boiling water reactor (not applicable to the APR1400)

e. Subsection 15.6.5 – Loss-of-coolant accidents (LOCAs) resulting from a spectrum of postulated piping breaks within the reactor coolant pressure boundary (RCPB)

15.6.1 Inadvertent Opening of a PWR Pressurizer Pressure Relief Valve

The evaluation of an inadvertent opening of a POSRV is described in Subsection 15.6.5 presenting SBLOCA.

15.6.2 Failure of Small Lines Carrying Primary Coolant Outside Containment

15.6.2.1 Identification of Causes and Frequency Classification

The direct release of reactor coolant may result from a break or leak outside the containment of a letdown line, instrument line, or sample line. A double-ended break of the letdown line outside the containment upstream of the letdown isolation valve is selected for this analysis because it is the largest line and thus results in the largest release of reactor coolant outside the containment.

To prevent POSRVs from opening due to a spurious electrical signal or operator error, one of the two motor operated pilot valves is designed to be powered off during the normal operation, therefore, a spurious electrical signal or operator error is not applicable to the APR1400.