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.:	**412-8525**
SRP Section:	**08.04 – Station Blackout**
Application Section:	**08.04**
Date of RAI Issue:	**02/22/2016**

Question No. 08.04-12

In response to RAI 7928, Question 08.04-3, the applicant states: "[t]he AAC [gas turbine generator] GTG is capable of supplying power for the shutdown loads required to bring the plant to the hot shutdown condition during an [station blackout] SBO." This information is not provided in the DCD.

Please revise Section 8.4 of the DCD Tier 2 to incorporate the above information.

Response

The following description of AAC GTG capability will be added in DCD Tier 2, Subsection 8.4.1.2: "The AAC GTG is capable of supplying power for the shutdown loads required to bring the plant to the hot shutdown condition during an SBO."

Impact on DCD

DCD Tier 2, Subsection 8.4.1.2 will be revised as shown in the Attachment.

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.

a. The first design factor is the redundancy of the onsite emergency alternating current (EAC) power system. The onsite EAC power system for the APR1400 consists of two redundant systems that have four independent Class 1E EDGs. One Class 1E EDG (train A or B) is required to operate the ac-powered decay heat removal systems. Therefore, the EAC power configuration group selected for the APR1400 is group "C" in accordance with Table 3 of NRC RG 1.155.

b. The second design factor is the reliability of the onsite EAC power sources. The APR1400 selects a target EDG reliability of 0.95. The reliable operation of the EAC power sources is provided reasonable assurance by a reliability program that is in accordance with NRC RG 1.9 (Reference 5) and NRC RG 1.155 Position C.1.2.

c. The third design factor is the expected frequency of a LOOP. The offsite power system is site-specific and not part of the APR1400. Therefore, the offsite power design characteristic group for the APR1400 is selected as "P3" for conservatism in accordance with Table 4 of NRC RG 1.155.

d. The fourth design factor is the probable time needed to restore offsite power. This factor is incorporated into the "P3" grouping addressed previously.

Based on the above condition, the SBO coping duration for the APR1400 is 16 hours in accordance with Table 2 of NRC RG 1.155.

The AAC GTG is capable of supplying power for the shutdown loads required to bring the plant to the hot shutdown condition during an SBO.

8.4.1.3 Alternate AC Power Source

The 4.16 kV non-Class 1E AAC GTG is provided as an AAC source to mitigate the SBO in accordance with Position C.3.3 of NRC RG 1.155. The AAC GTG has sufficient capacity to operate the system necessary for coping with the SBO for the time required to bring and maintain the plant in a safe shutdown condition. This design meets the requirements of Criterion 4 for NRC RG 1.155, Position C.3.3.5. The reliability of the AAC power system meets or exceeds 95 percent as determined in accordance with NSAC-108 (Reference 6). The SBO loads for the AAC GTG are shown in Table 8.3.1-4. The AAC power source for the APR1400 is designed to meet the requirements of 10 CFR 50.63, NRC RG 1.155, and NUMARC 87-00 (Reference 7).

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Question No. 08.04-16

In response to RAI 8192, Question 08.04-8, the applicant provided the kilo Volts Amperes (kVA) and the power factor (pf) of the AAC GTG and the total SBO loads. This information is not provided in the DCD.

Please revise Section 8.4 of the DCD Tier 2 to include the kVA and pf of the AAC GTG and the SBO loads.

Response

The kVA and PF of the AAC GTG and the SBO loads will be added to the DCD as follows:

> Power factors of 0.8 for the AAC GTG and 0.85 for the SBO loads were conservatively used for calculating the capacity of the AAC GTG since the specific load data will be determined at the time of procurement. The resulting capacity of the AAC GTG was established to be 12,125 kVA and the SBO loads 10,228 kVA.

Impact on DCD

DCD Tier 2, Subsection 8.4.1.4 will be revised as shown in the Attachment.

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.

8.4.1.4 Power Supply from AAC GTG

The power supply from the AAC GTG to the dedicated train of the onsite Class 1E switchgear buses (train A or train B) is accomplished with the following operating procedures:

a. The undervoltage signals on the PNS 4.16 kV buses automatically initiate the starting of the AAC GTG and the tripping of incoming circuit breakers from the offsite power supply sources.

b. The AAC GTG circuit breaker in the AAC switchgear is closed manually after the AAC GTG attains the rated voltage and frequency. The power supply from the AAC GTG is restored to the PNS 4.16 kV buses manually. The loads on the PNS 4.16 kV buses are started manually by operator action.

c. The Class 1E bus tie circuit breaker in the AAC switchgear and the AAC bus tie circuit breaker in the Class 1E 4.16 kV switchgear are normally open.

d. All loads on the Class 1E 4.16 kV buses except the 480V load centers are tripped automatically by undervoltage signals on the Class 1E 4.16 kV bus. All loads on the PNS buses, as shown in Table 8.3.1-5, are tripped by manually opening the respective tie breakers.

e. The dedicated Class 1E 4.16 kV bus is energized from the AAC GTG by manually closing the associated Class 1E bus tie circuit breaker in the AAC switchgear and the AAC bus tie circuit breaker in the Class 1E 4.16 kV bus.

f. The SBO loads for the AAC GTG, as shown in Table 8.3.1-4, are energized by manual operation.

The COL applicant is to develop detailed procedures for manually aligning the alternate AC power supply when two (Trains A and B) of the four diesel generators are unavailable during a loss of offsite power event (COL 8.4(2)).

Power factors of 0.8 for the AAC GTG and 0.85 for the SBO loads were conservatively used for calculating the capacity of the AAC GTG since the specific load data will be determined at the time of procurement. The resulting capacity of the AAC GTG was established to be 12,125 kVA and the SBO loads 10,228 kVA.