
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.: 109-8079
SRP Section: 08.02 – Offsite Power Systems (Offsite)
Application Section: 8.2
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Question No. 08.02-5

GDC 18 requires that electric power systems important to safety be designed to permit appropriate periodic inspection and testing of important areas and features to assess the continuity of the systems and the condition of their components. SRP Section 8.2 provides information on compliance with GDC 18 and states: “[The electric power] systems shall be designed to test periodically: (1) the operability and functional performance of the components of the offsite power systems, such as onsite power sources, relays, switches, circuit breakers, and buses, and (2) the operability of the systems as a whole and, under conditions as close to design as practical, the full operational sequence that brings the systems into operation, including operation of applicable portions of the protection system, and the transfer of power among the nuclear power unit, the offsite power system, and the onsite power system.”

DCD Tier 2, Section 8.2.2.1 discusses conformance with GDC 18, stating that “the offsite power system of the APR1400 has the capability to perform integral testing on a periodic basis.”

Please provide a discussion of the periodic testing of the offsite power system, addressing the operability and functional performance of the components of the offsite power system, such as relays, switches, circuit breakers, and buses. Please confirm whether the testing includes: (1) verification of the correct circuit breaker alignment in the switchyard, (2) indication of offsite power availability, and (3) transfer of power among the nuclear power unit, the offsite power system, and the onsite power system.

Response

In compliance with GDC 18 and SRP section 8.2, the offsite power system is accessed for required periodic inspection and testing, enabling verification of important system parameters, performance characteristics, and features and detection of degradation and/or impending failure under controlled conditions.

The periodic testing of the offsite power system includes equipment and system tests associated with the preferred power supply (PPS) according to the requirements of IEEE Std. 765. The purpose of these tests is to demonstrate that the equipment and system of the offsite power system are operational.

The following requirements will be demonstrated through the periodic testing of the offsite power system:

- The loss of the PPS is detected and offsite power availability is indicated.
- Transfers among the nuclear power unit, the PPS's, and the onsite power system are accomplished.
- The components of the offsite power system associated with the PPS, such as relays, switches, circuit breakers (including circuit breakers alignment in the switchyard), and buses are operable.

Below shown is a summary of typical periodic equipment and system tests for the offsite power system including the operability and functional performance of the components.

Periodic equipment tests

Component	Frequency	Required inspection and testing
Circuit breakers	• Every 5 years (before 10 years, see note)	• Inspection of the auxiliary relays and contacts
	• Every 3 years (after 10 years)	
	• Every 2 years	• Operability test
Gas insulated substation (GIS) including bus and disconnecting switch (DS)	• Every 5 years (before 10 years, see note)	• Inspection of the GIS control panels
	• Every 3 years (after 10 years)	• Insulation aging measurement
	• Every 2 years	• Switching test (for DS only)
Station batteries	• Every 3 months	• Operability test
Chargers	• Every 3 years	• Voltage measurement
		• Specific gravity measurement
		• Internal resistance measurement
Current Transformers (CT) and Potential Transformers (PT)	• Every 3 years	• Voltage measurement
		• Insulation resistance measurement
		• Checking the transfer between the AC input and bypass power
		• Ripple voltage measurement for DC output
Relays	• Every 5 years (before 10 years, see note)	• Insulation resistance measurement
	• Every 3 years (after 10 years)	• Insulation aging measurement
		• Voltage and current measurement
Unit Auxiliary Transformer (UAT) and Stand-by Auxiliary Transformer (SAT)	• Every 3 years	• Operability test
		• Voltage and current measurement in CT and PT circuits
	• Every 18 months	• Inspection of the mechanical protective devices
		• Cooling fan and insulation oil check
		• Inspection of earthing switch (ES)
		• Inspection of control panel

Note) including initial operational test which takes place one year after the commercial operation

Periodic system tests

Periodic system tests of offsite power system will be performed at scheduled intervals to demonstrate operability of the offsite power supply system including availability of Class 1E and non-Class 1E power from the PPS, detection of the loss of the PPS, transfers between redundant PPS, and adequacy of other supporting systems as described in IEEE Std. 765, Section 6.3.

The surveillance requirements (SRs) included in DCD, Tier 2, Chapter 16 (Technical Specifications) exhibit periodic surveillance actions (with testing if required) and frequencies required in all plant operation modes to meet the associated limiting conditions for operation (LCOs).

The periodic testing items the staff requested to confirm are included in the Technical Specifications, Subsection 3.8.1 as the following.

- 1) Verification of the correct circuit breaker alignment in the switchyard (SR 3.8.1.1)
- 2) Indication of offsite power availability (SR 3.8.1.11 and 3.8.1.19)
- 3) Transfer of power among the nuclear power unit, the offsite power system, and the onsite power system (SR 3.8.1.8 and 3.8.1.16)

In addition, as mentioned in DCD Tier 2, Subsection 8.2.1.3, the COL applicant is to describe how testing, including periodic testing, is performed on the offsite power system components, as described in COL 8.2(8).

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.