

## 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.: 414-8531

SRP Section: 10.02.03 – Turbine Rotor Integrity

Application Section: 10.02.03

Date of RAI Issue: 02/22/2016

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### **Question No. 10.02.03-2**

In response to RAI 288-8328, your letter dated December 17, 2015, stated that COL 10.2(3) will be revised (**in bold**) to specify the following, in order to resolve the NRC staff's RAI that an applicable COL information Item be added to specify that the COL applicant shall provide the site-specific turbine rotor inservice inspection program and inspection interval, including the turbine valve test and inspection program and test and inspection frequency:

“The COL applicant is to provide a description of how the turbine missile analysis conforms with Subsection 10.2.3.6 to ensure that the requirements for protection against turbine missiles (e.g., applicable material properties, method of calculating the fracture toughness properties per SRP Section 10.2.3 acceptance criteria, preservice inspections, **in-service tests and inspections**) will be met.”

This revision of COL 10.2(3) clarifies what the turbine missile probability analysis takes into account, but does not specify that the COL applicant will provide the site-specific turbine rotor inservice inspection program and inspection interval, including the turbine valve test and inspection program and test and inspection frequency. An applicable COL information Item should be added to ensure the COL applicant provides a description of this information as specified in SRP Section 10.2.3, Paragraphs I.5 and II.5, and to be consistent with APR1400 FSAR Tier 2, Section 10.2.3.5.

### **Response**

To clarify that the COL applicant shall provide the site-specific turbine rotor inservice inspection program and inspection interval, including the turbine valve test and inspection program and test and inspection frequency, APR1400 DCD Section 10.2.3.5 will be revised to add a COL item.

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**Impact on DCD**

DCD Subsection 10.2.3.5, Subsection 10.2.5 Combined License Information and Table 1.8-2 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 Report**

There is no impact on any Technical, Topical and Environmental Reports.

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The final overspeed basis and setpoints are included with the turbine missile probability analysis.

- e. The turbine rotor design facilitates inservice inspection of high-stress regions.
- f. The turbine missile probability analysis described in Subsection 10.2.3.6 contains additional descriptions of the design features of the turbine, rotor, shaft, couplings, and blades, including the number of stages, blade design, how the blades are attached to the rotor, how the turbine rotor is forged, and pertinent fabrication methods. Informational drawings are included as required to illustrate important design features.
- g. The turbine missile probability analysis described in Subsection 10.2.3.6 includes an analysis of turbine component loading. The analysis includes rotor and blade loading combinations. The analysis shows that the rotor and blades have adequate margin to withstand loadings imposed during postulated overspeed events up to 120 percent of rated speed without detrimental effects.

#### 10.2.3.5 Inservice Inspection

The turbine and turbine valve inservice test and inspection program includes scope, frequency, methods, acceptance, disposition of reportable indications, corrective actions, and technical basis for inspection frequency. In-service test, inspection, and operating procedures shall be verified by ITAAC to be in accordance with industry practice and to ensure the validity assumptions/input of turbine missile probability analysis report.

The inspections are performed during refueling outages on an interval consistent with the inservice inspection schedules in ASME Section XI (Reference 7) and the inspection intervals from the turbine manufacturer's turbine missile analysis provided by the COL applicant as described in Subsection 3.5.1.3. The COL applicant shall provide the site-specific turbine rotor inservice inspection program and inspection interval consistent with the manufacturer's turbine missile analysis ← (COL 10.2(5))

, including the turbine valve test and inspection program and test and inspection frequency

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Appropriate radiological controls can be applied to steam systems in the event that such leakage occurs. Discussions of the radiological aspects of primary-to-secondary leakage are presented in Chapter 11.

**10.2.5 Combined License Information**

COL 10.2(1) The COL applicant is to identify the turbine vendor and model.

COL 10.2(2) The COL applicant is to identify how the functional requirements for the overspeed protection system are met and provide a schematic of the TGCS and protection systems from sensors through valve actuators.

COL 10.2(3) The COL applicant is to provide a description of how the turbine missile probability analysis conforms with Subsection 10.2.3.6 to ensure that requirements for protection against turbine missiles (e.g., applicable material properties, method of calculating the fracture toughness properties per SRP Section 10.2.3 Acceptance Criteria, preservice inspections) will be met.

**10.2.6 References**

COL 10.2(5) The COL applicant shall provide the site-specific turbine rotor inservice inspection program and inspection interval, including the turbine valve test and inspection program and test and inspection frequency consistent with the manufacturer's turbine missile analysis.

1. ASME Section VIII, Division 1, "Rules for Construction of Pressure Vessels," the American Society of Mechanical Engineers, the 2013 Edition.
2. IEEE Standard C50.13-2014, "IEEE Standard for Cylindrical - Rotor, 50 Hz and 60 Hz Synchronous Generators Rated 10 MVA and Above," Institute of Electrical and Electronics Engineers, 2014.
3. ASTM A470, "Standard Specification for Vacuum-Treated Carbon and Alloy Steel Forgings for Turbine Rotors and Shafts," American Society for Testing and Materials, 2010.
4. ASTM A370, "Standard Test Methods and Definitions for Mechanical Testing of Steel Products," American Society for Testing and Materials, 2014.

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Table 1.8-2 (16 of 29)

Item No.	Description
COL 9.5(7)	The COL applicant is to provide the fire brigade radio systems.
COL 9.5(8)	The COL applicant is to provide the LAN and VPN system.
COL 9.5(9)	The COL applicant is to provide the emergency offsite communication system including dedication hotline, local law enforcement radio equipment, and wireless communication system.
COL 9.5(10)	The COL applicant is to specify that adequate and acceptable sources of fuel oil are available, including the means of transporting and recharging the fuel storage tank, following a design basis accident.
COL 9.5(11)	The COL applicant is to provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.
COL 9.5(12)	The COL applicant is to provide the security radio system that consists of a base unit, mobile units, and portable units.
COL 9.5(13)	The COL applicant is to provide the local law enforcement communications including dedicated conventional telephone and radio-transmitted two-way communication system.
COL 9.5(14)	The COL applicant is to provide electric power for the security lighting system.
COL 9.5(15)	The COL applicant is to provide the system design information of AAC GTG building HVAC system including flow diagram, if the AAC GTG building requires the HVAC system.
COL 10.2(1)	The COL applicant is to identify the turbine vendor and model.
COL 10.2(2)	The COL applicant is to identify how the functional requirements for the overspeed protection system are met and provide a schematic of the TGCS and protection systems from sensors through valve actuators.
COL 10.2(3)	The COL applicant is to provide a description of how the turbine missile probability analysis conforms with Subsection 10.2.3.6 to ensure that requirements for protection against turbine missiles (e.g., applicable material properties, method of calculating the fracture toughness properties per SRP Section 10.2.3 Acceptance Criteria, preservice inspections) will be met.
COL 10.3(1)	The COL applicant is to provide operating and maintenance procedures including adequate precautions to prevent water (steam) hammer and relief valve discharge loads and water entrainment effects in accordance with NUREG-0927 and a milestone schedule for implementation of the procedure.
COL 10.3(2)	The COL applicant is to establish operational procedures and maintenance programs as related to leak detection and contamination control.
COL 10.3(3)	The COL applicant is to provide a description of the FAC monitoring program for carbon steel portions of the steam and power conversion systems that contain water or wet steam and are susceptible to erosion-corrosion damage. The description is to address consistency with GL 89-08 and NSAC-202L-R3 and provide a milestone schedule for implementation of the program.

COL 10.2(5) The COL applicant shall provide the site-specific turbine rotor inservice inspection program and inspection interval, including the turbine valve test and inspection program and test and inspection frequency consistent with the manufacturer's turbine missile analysis.