Request for Additional Information No. 106 (1265, 1262), Revision 0

10/28/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 10.02 - Turbine Generator
SRP Section: 10.03 - Main Steam Supply System
Application Section: FSAR Ch. 10

QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)

10.02-5

I. FSAR Tier 2 Section 10.2A.2.9, "Overspeed Protection," states that two independent electrical over-speed devices are provided, one of which may be a conventional mechanical type device located on the turbine control shaft or an electrical overspeed protection system. The criteria specified in Items 2.C and 2.D of Section III, "Review Procedures," of SRP Section 10.2 states that a mechanical overspeed trip device will actuate the control, stop, and intercept valves at approximately 111 percent of rated speed. If the COL applicant selects the overspeed control system with two electrical over-speed trip devices, instead of one mechanical and one electrical, please address the following in the FSAR:

a. Justify the diversity of the two electrical over-speed systems.
b. Justify the utilization of the a second electrical device in lieu of a mechanical device.
c. Confirm that the two systems do not share any common components or process inputs. If they do, provide an evaluation of the impact of failures of any such components.
d. Describe any software used for the triple processors or performing trip logic actuation.
e. Explain the diversity and defense-in-depth used to defend against a common cause failure (CCF) of the triple processor functions.
f. Confirm the objectives of Test #174 are correctly described.

Also, the reasoning is not clear for describing the two electrical trip devices in this alternate turbine design. With the two electrical trip devices for the emergency overspeed control, describe the differences of this alternate option from the primary design. The staff requests the applicant to clearly define in the FSAR the alternate design, and provide justification to call this an alternate design.

II. SRP Section 10.2, "Turbine Generator, Subsection II, "Acceptance Criteria," Item 1.C, states that the TG should have the capability to permit periodic testing of components important to safety while the unit is operating at rated load.

FSAR Tier 2, Section 10.2A.2.12, Turbine Inservice Inspection and Testing," states that the main steam stop and control valves, reheat stop and intercept valves, and steam extraction no return valves are exercised on a frequency

consistent with turbine manufacturer recommendations. However, the application did not state whether or not valve design is such that monthly exercising can be performed at full load per the SRP. Therefore, the staff requests the applicant to clarify in the FSAR the capability of the EPR turbine to be tested for each valve for a full stroke closed at 100 percent full power.

III. In order to meet the GDC 4 criteria, FSAR Tier 2 Section 10.2A.2.12, states that TG valves are exercised periodically and observed for valve motion. Tier 1 Figure 2.8.1-1 indicates that exercising a single control or stop valve would result in the isolation of flow from a steam line and steam generator.

However, it is not clear from the FSAR, whether the TG stop or control valve in each of the main steam lines are arranged such that by closing a valve will allow diverting its steam flow to the other three. Therefore, the staff requests the applicant to describe in the FSAR, the details on the steam flow path during stop and control valve testing. Also, state in the FSAR, whether normal operation will utilize either full or partial arc control.

10.03-1

I. GDC 4 requires that the main steam supply system (MSSS) design need to have capability to withstand the effects of steam and water hammer and relief valve discharge loading. FSAR Tier 2 Section 10.3.3 states that the MSSS design considers steam and water hammer loads due to rapid valve closure, and relief valve thrust loads. Furthermore, the MSSS design includes protection against water entrainment by sloping the MSSS piping to drain low points. However, the FSAR does not describe the application of these loads to the MSSS design. Also, the FSAR states procedures should be implemented to preclude steam hammer loads; but, the FSAR does not address any COL information item for the COL applicants to develop and implement these procedures. Therefore, the staff requests the applicant to provide additional MSSS design details in the FSAR for accommoding hammer and thrust loads. Also, the staff requests the applicant to provide a COL information item in the FSAR to assure procedures are established to preclude steam hammer.

II. GDC-34 requires main steam supply system (MSSS) capability to transfer residual and sensible heat from the reactor coolant system (RCS). Also, the acceptance of the MSSS is abased on meeting the guidance of Branch Technical Position 5-4, “Design Requirements of the Residual Heat Removal System,” Issue 1 of NUREG-0138, “Staff Discussion of Fifteen Technical Issues Listed in **….**Issue 1 of NUREG-0138 relative to utilizing the turbine **...”**

The failure Modes and Effects Analyses related to the main steam relief control valves (MSRCVs) are provided in FSAR Tier 2 Table 10.3-4, “Main Steam Supply System Single Active Failure Analysis,” and Tier 2 Table 7.3-2, “FMEA Summary for ESF Actuations.” However, it is not clear whether a single-failure analysis has been performed on the controls for the MSRCVs. FSAR Tier 2 Table 10.3-4 discusses power failures associated with MSRCVs and Tier 2 Table 7.3-2 evaluates emergency safety features (ESF) control failures. However, it is not clear whether an evaluation is performed to conclude that single control failures will not impact more than one MSRCV at a time. Therefore, the staff requests the applicant to provide in the FSAR clarification

in this regard to ensure that a single control failure will not impact more than one MSRCV.

III. 10 CFR 52.47(b)(1) requires that a design-certification application contain inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that a plant that incorporates the design certification is built and will operate in accordance with the certification. ITAAC for the main steam supply system (MSSS) is provided in FSAR Tier 1, Table 2.8.2-3 "MSS Inspections, Tests, and Acceptance Criteria." The staff reviewed these ITAAC requirements and finds them adequate, except that inspection and testing associated with the main steam relief control valves (MSRCVs) do not confirm the throttling and control capabilities required of these valves. For example, Item 7.3 in the above Table 2.8.2-3 provides testing for full-flow capacity of the main steam relief train (MSRT), i.e. with the MSRCV fully open. Similarly, Item 7.1 in the table will test that MSRCVs with positions as shown in Table 2.8.2-2 (i.e., one of which is throttled). However, the FSAR doesn't identify which throttle positions are tested, and ensure the post-accident partial cool-down. Similarly, Test #148 of FSAR Tier 2 Chapter 14.2 (Initial Plant Test Program) provides some testing of valve signals and position indicators, but does not fully test the accident mitigation features. Therefore, the staff requests additional information and/or clarification in the FSAR in this regard.

IV. Please provide additional information, as relates to safety-related function of the following MSRCVs and MSIVs:

1. FSAR Section 10.3.2.2, "Component Description," states that the MSRCVs provide a safety-related function of controlling MSRT steam flow to prevent over cooling of the reactor coolant system. The MSRCVs allow mitigation of the effects of a stuck open main steam relief isolation valve (MSRIV). Describe in the FSAR the design and operation of the MSRCVs that would achieve the above stated safety-related function.

2. Also, FSAR Section 10.3.2.2 states that the MSSS piping system is designed with a capability to periodically test the operability of the MSIVs and associated apparatus and determine if valve leakage is within acceptable limits. Provide the following clarifications in the FSAR:

    a. The acceptable limits of the leakage through each MSIV from either direction.

    b. Assure these acceptable limits of the leakage through each MSIV are consistent with the assumptions made in main steam line break analyses documented in FSAR Section 15.1.5. Specify the location in the FSAR of these MSIV leakage limits.

3. With respect to safety-related MSIV actuators, provide the methodology for the protection of these actuators from environmental effects and dynamic effects (pipe whip and jet impingement forces) from a main steam line break upstream of the MSIV associated with the broken line.