Request for Additional Information No. 33, Revision 0

8/07/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 04.03 - Nuclear Design
SRP Section: 04.06 - Functional Design of Control Rod Drive System
Application Section: FSAR Ch 4
SRSB Branch

QUESTIONS

04.03-1

FSAR Section 4.3.2.2.6, Limiting Power Distributions, states, that in determining the power distributions, it is further assumed that the total core power level would be limited by a reactor trip to below 116.7 percent of rated thermal power (see Table 15.0-7).

Justify the assumption that a reactor trip will occur before 116.7 percent of rated thermal power.

04.03-2

FSAR Section 4.3.3.1.3, Treatment of U. S. EPR Heavy Radial Reflector states, that since no measured data exist for a core with a heavy reflector, the reflector cross sections generated were qualified by comparing two-dimensional fresh core MCNP calculations to equivalent two-dimensional, two-group PRISM calculations.

Please provide the following information:

a. The quantified reduction of the neutron fluence on the reactor vessel and assessment of benefits.

b. The accuracy of the supporting calculations; such as, the accuracy the magnitude of the calculated benefits.

c. The version of MCNP used. Verify that the validation addresses similar configurations and the accuracy of the validation problems.

d. Plans to validate these predictions through comparisons with test results.

e. The flattening of power distribution and anticipated benefits, and

f. Assessment of the impact of the greater mass and surface area of the heavy reflector in the various phases of the transient and accident analyses.

g. Since no measured data exist for a core with a heavy reflector, justify its use and expected benefits in the EPR design.

04.03-6

Section 4.3.2.2.5, Local Power Peaking, of the EPR DC FSAR, states that:

> "Fuel densification, which has been observed to occur under irradiation in several operating reactors, causes the fuel pellets to shrink both axially and radially. As a result, gaps can occur in the fuel column if a pellet becomes wedged against the cladding and the pellets below settle in the fuel rod. The gaps, which are random and vary in length and location, result in decreased neutron absorption in the vicinity of the gap. This produces power peaking in the adjacent fuel rods, resulting in an increased power peaking factor for the core. A quantitative measure of this local power peaking is given by the power spike factor, S(Z), where Z is the axial location in the core.
>
> Fuel manufacturing practices for modern nuclear fuel designs have largely eliminated the potential for significant fuel densification and gap formation during reactor operation. Therefore, it is appropriate to use a power spike factor of 1.0 for the U.S. EPR fuel. Justification for a spike factor of 1.0 is contained in Core Operating Limit Methods for Westinghouse-Designed PWRs (Reference 4)."

Reference 4 of the EPR DC FSAR is BAW-10163P-A, "Core Operating limit methodology for Westinghouse designed PWRs," B&W Fuel Company, June 1989. Justify the applicability of Reference 4 to the EPR fuel, fuel manufacturing and core design parameters.

04.06-1

In FSAR 4.6.2 (page 4.6-3), the applicant refers to "ASME Section III (Reference 3)." However, there is no reference for ASME Section III in the list of references (FSAR 4.6.6).

In FSAR 4.6.2 (page 4.6-3), the applicant refers to "IEEE 384-1992 (Reference 4)." However, there is no Reference 4 in the list of references (FSAR 4.6.6). The correct reference is Reference 3.

04.06-2

FSAR Section 4.6.4 states that the U.S.EPR contains two independent reactivity control systems in accordance with GDC 26: the control rods and the soluble boron in the coolant from the CVCS, SIS or EBS systems. SRP Section 4.6 under GDC 26 requirements refers also to the system redundancy and capability. SRP and FSAR Sections 4.6 also refer to GDC 27 as it relates to the combined capability of control rod system and the ECCS to reliably control reactivity changes to assure that under postulated accident conditions the capability to cool the core is maintained. A short summary of the SIS, EBS, and CVCS systems is provided in FSAR Section 4.6.4.

In FSAR Section 4.6.5, the combined performance of the reactivity control systems is discussed. It is concluded that these analyses (Chapter 15) demonstrate that the Control Rod Drive System and SIS and EBS systems reliably control reactivity changes to cool the core under postulated accidents in accordance with GDC 27. Please clarify the combined system performance and how these three independent systems (SIS, EBS, and CVCS) contribute to the redundancy of the reactivity control system. Also indicate where and how these systems are addressed in the Technical Specifications (i.e., 3.1, etc.).