Request for Additional Information No. 50 (927,928) Revision 0

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U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 04.05.02 - Reactor Internal and Core Support Structure Materials
Application Section: FSAR Ch 4
CIB1 Branch

QUESTIONS

04.05.02-1

Table 4.5-2 of the U.S. EPR FSAR, Tier 2 provides the materials to be used for the reactor vessel internals.

a) Table 4.5-2 of the U.S. EPR FSAR, Tier 2 includes the reactor vessel internals weld Type 304L, per weld material specification SFA5.4, 5.9 or 5.22. Clarify what type of weld material is Type 304L or whether this is a typographical error, since it is not listed in the aforementioned weld material specifications.

b) Provide the material specification for the "Cobalt Alloy" specified in Table 4.5-2 of the U.S. EPR FSAR, Tier 2 for the Upper Internals Assembly and the heavy reflector. In addition, discuss how this alloy will be used (i.e., components, location, design) in the upper internals assembly and in the heavy reflector along with any operating experience with this alloy.

04.05.02-2

Section 4.5.2.2 of the U.S. EPR FSAR, Tier 2 states that when Section 5.2.3 of the U.S. EPR FSAR is applied to the welding of reactor vessel internals and core support materials, the ASME Code, Section III applies in accordance with GDC 1 and 10 CFR 50.55a. Clarify this statement in order to facilitate which reactor vessel internal components and core support components will be fabricated using the ASME Code.

04.05.02-3

Section 4.5.2.1 of the U.S. EPR FSAR, Tier 2 states, "There are no other materials used in the reactor internals or core support structures that are not otherwise allowed under ASME Code, Section III, Subsection NG-2120."

a) Explain this statement with respect to whether Table 4.5-2 of the U.S. EPR FSAR, Tier 2 includes all materials and their corresponding material specifications that will be used for the reactor vessel internals and core supports. If Table 4.5-2 of the U.S. EPR FSAR, Tier 2 does not list all materials used, provide all of the material specifications, and their intended use for the corresponding component.

b) Will Alloy 600 and/or Alloy 82/182 be used for the reactor vessel core supports or reactor vessel internals? If this material is used, discuss how the use of this material will not degrade the component such that the component integrity and function is lost due to PWSCC as seen in current operating experience.

c) Discuss the extent to which Alloy 690 and Alloy 52/52M/152 will be used for reactor vessel core supports and reactor vessel internals?

04.05.02-4

Table 4.5-2 of the U.S. EPR FSAR, Tier 2 provides material specifications used for the heavy reflector, and Section 4.3.2.1 of the U.S. EPR FSAR, Tier 2 provides a description of the heavy reflector and states that it replaces the thin baffle plates used in existing reactors.

a) Will the heavy reflector experience a fluence of $5x10^{20}$ n/cm^2 (E▲1.0 MeV) or greater in the proposed 60-year life of the U.S. EPR, thereby making the heavy reflector susceptible to IASCC? Discuss how the heavy reflector will not lose its safety function or create loss parts that could affect safety related components and the safe shutdown of the reactor as required by GDC 1 of 10 CFR Part 50 and as discussed in SRP Section 4.5.2. Will the void swelling also affect the integrity of the heavy reflector during the life of the reactor?

b) The heavy reflectors have keyways in the reflector slabs to accommodate the vertical keys. Discuss how keyways and vertical keys are machined (i.e., radii of corners of keyways and keys, etc.) to prevent notches that can act as stress concentrations and crack initiation sites, thereby leading to the loss of function of the heavy reflector.

c) Section 4.3.2.1 states that the heavy reflector consists of stacked forged slabs (rings) positioned on above the other, and use vertical keys to align the slabs, and axially restrain the slabs by tie rods bolted to the lower core support plate.

- Provide in the FSAR a detailed drawing of the heavy reflector and its components, along with the corresponding material used for these components.

- Table 3.9.5-1 lists upper core plate guide pins, centering pins, normal and centering rings, and positioning keys, but are not described in the FSAR section or applicable drawings. Provide in the FSAR the material, location, and function of these components.

- Tie rods are listed as internal structures, but axially restrain the heavy reflector slabs, thereby providing structural support for the heavy reflector, which is a core support structure. Discuss in detail the function of the tie rods and whether the tie rods provide a core support function by maintaining the integrity of the heavy reflector, which is a core support structure. In addition, discuss how stress relaxation or

loss of preload will not degrade the component such that the component (heavy reflector) will not satisfactorily perform its intended safety function as required by GDC 1 of 10 CRF Part 50.

04.05.02-5

Will tools used in abrasive work on austenitic stainless steels surfaces be controlled per the requirements in RG 1.37, similar to Section 4.5.1.2.1 of the U.S. EPR FSAR, Tier 2, to prevent the introduction of containments that may promote SSC in accordance with GDC 14? Is so, include this guidance in Section 4.5.2 of the U.S. EPR FSAR, Tier 2.

04.05.02-6

Table 4.5-2 of the U.S. EPR FSAR, Tier 2 provides the material for the lower internals, and Section 3.9.5.1.2.5 of the U.S. EPR FSAR, Tier 2 describes that the lower internals are centered within the reactor pressure vessel by radial key that are welded to and integral with the reactor pressure vessel.

a) Describe in the FSAR the material used for the radial key inserts, and how the radial key inserts are welded (material, welding process, joint design, etc.) to the RPV.

b) After welding the radial key inserts to the low alloy steel RPV, will the RPV be heat treated? If the RPV is heat treated, discuss how it will affect the radial key inserts and its weld (i.e., sensitization of stainless steel, etc.).

c) If the radial key inserts are subjected to a fluence of $5x10^{20}$ n/cm^2 (E>1.0 MeV) or greater in the proposed 60-year life of the U.S. EPR, thereby making the radial key inserts susceptible to IASCC, discuss how the radial key inserts that support the core will not degrade the component such that the component will not satisfactorily perform its intended safety function as required by GDC 1 of 10 CRF Part 50.

04.05.02-7

Is the core barrel weld in the vicinity of the core, and will it be subjected to a fluence of $5x10^{20}$ n/cm^2 (E>1.0 MeV) or greater in the proposed 60-year life of the U.S. EPR, thereby making the core barrel susceptible to IASCC? Discuss design considerations for the core barrel to ensure that any degradation will not impact other safety-related RPV components and cause it to lose its intended safety function as required by GDC 1 of 10 CRF Part 50.

04.05.02-8

Section 3.9.5.1.3.4 of the U.S. EPR FSAR, Tier 2 states that the columns are bolted to the upper support plate. Discuss design considerations taken to account for bolt stress relaxation or loss of preload such that the integrity of the bolted components and their intended safety function are not adversely affected as required by GDC 1 of 10 CFR Part 50.