AREVA

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U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Response to the Third Request for Additional Information Regarding ANP-10287P, "Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report" (TAC No. Q00013)

Ref. 1: Letter, Ronnie L. Gardner (AREVA NP Inc.) to Document Control Desk (NRC), "Request for Review and Approval of ANP-10287P, 'Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report'," NRC:07:068, November 27, 2007.

Ref. 2: Letter, Getachew Tesfaye (NRC) to Ronnie L. Gardner (AREVA NP Inc.), "Third Request for Additional Information Regarding ANP-10287P, 'Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report (TAC No. Q00013)'," April 9, 2009.

AREVA NP Inc. (AREVA NP) requested the NRC's review and approval of topical report ANP-10287(P), "Incore Trip Setpoint and Transient Methodology for U.S. EPR Topical Report" in Reference 1. The NRC provided a third Request for Additional Information (RAI) regarding this topical report in Reference 2. The response to this RAI is enclosed with this letter.

If you have any questions related to this submittal, please contact Ms. Sandra M. Sloan, Regulatory Affairs Manager for New Plants. She may be reached by telephone at 434-832-2369 or by e-mail at sandra.sloan@areva.com.

Sincerely,

Ronnie L. Gardner, Manager
Corporate Regulatory Affairs
AREVA NP Inc.

Enclosure

cc: G. Tesfaye
Docket 52-020

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NRO

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RAI-30. *The analysis bases for setpoint generation provide assurance that DNBR and LPD criteria will not be violated with 95/95 probability when up to five SPND failures are present. Provide a description of the required actions when more than 5 SPNDs, i.e, 6, 7 or more SPNDs are identified as invalid. Provide the Technical Specification sections that describe these actions. Clarify how many individual SPND failures would trigger the graduated reactor trip set points for LDNBR function.*

The response to RAI 26 indicated that an automatic reactor trip function is implemented in the case of seven or more invalid SPND measurements. Provide clarification on the definition of an invalid SPND measurement. Describe how the system detects the failure of a SPND.

Response to RAI-30:

As part of the Response to Question 16-195, Reference 1, AREVA NP stated that U.S. EPR FSAR Tier 2, Chapter 16, Technical Specifications and Technical Specifications Bases will be revised to specify 67 self-powered neutron detectors (SPND) as the "Minimum Required for Functional Capability." As shown in the mark-up for U.S. EPR FSAR Tier 2, Chapter 16, Technical Specification, Table 3.3.1-1 (Page 3.3.1-11), if fewer than 67 SPNDs are operable, the operators are directed to implement Condition H. Condition H requires the plant to reduce thermal power to less than 10 percent Rated Thermal Power within 6 hours. As addressed in the Bases for this action:

> "If Table 3.3.1-1 directs entry into Condition H, the unit must be brought to a condition in which the supported reactor trips or ESF functions are not required to be OPERABLE. The allowed Completion Time of 6 hours is reasonable, based on operating experience, to reduce THERMAL POWER from full power to less than 10% in an orderly manner and without challenging unit systems."

The Low departure from nucleate boiling ratio (DNBR) reactor trip (RT) function calculates 12 DNBR values (one per SPND finger). If any SPND on a finger is invalid, that finger is invalidated and a graduated RT setpoint is activated.

Assuming 72 SPND measurements are valid, then one SPND fails, the associated finger is invalidated and the first graduated setpoint is activated. If a second SPND on the same finger becomes invalid, the first graduated setpoint is still used (the same finger was already invalidated). If a third SPND becomes invalid, this time on a different finger, then that finger is also invalidated and the second graduated setpoint becomes active (two fingers are invalidated). Additional examples are provided as follows:

- Six invalid SPNDs, all belonging to one finger: 1st graduated setpoint (Condition H would be entered).
- Three invalid SPNDs, each belonging to a different finger: 3rd graduated setpoint.

- Four invalid SPNDs, one belonging to one finger and three belonging to a second finger: 2nd graduated setpoint.
- Five invalid SPNDs, each belonging to a different finger: 5th graduated setpoint.

For the high linear power density (HLPD) RT function, a graduated setpoint is activated for each invalid SPND, regardless of which finger the SPND is associated with.

Each digital signal within the protection system is represented by a value and a status. The status is either valid or invalid (sometimes referred to as "faulty"). If a signal carries a valid status, the signal value is used in processing. If a signal carries an invalid status, the signal value is disregarded in processing. An "invalid SPND" is defined as one whose measurement signal within the protection system carries an invalid status.

An SPND measurement signal can be given an invalid status through one of the following mechanisms:

- If maintenance is being performed on an SPND input channel, or if an SPND is suspected faulty, it can be manually placed in a "lockout" condition using the lockout software function within the protection system. An SPND measurement that is locked out carries an invalid status.
- The protection system checks each SPND measurement to verify that it is within a predefined range. If a measurement is outside of this range, it is marked with an invalid status.
- The redundant measurements of each SPND can be compared to each other within the protection system. If there is sufficient discrepancy between the redundant values, that SPND measurement can be marked with an invalid status.
- The protection system monitors the status of hardware used in the SPND input channel as part of its cyclic self-monitoring. If hardware is detected as faulty, the associated SPND measurement(s) is marked with an invalid status.
- In case of a communication failure between protection system computers, the receiving computer marks all signals in the faulted data message with an invalid status. A detailed description of detecting and accommodating communication failures with respect to the transmission of SPND measurements can be found in the Response to RAI-38, Reference 2.

References for RAI-30:

1. E-mail, Ronda M. Pederson (AREVA NP Inc.) to Getachew Tesfaye (NRC), "Response to U.S. EPR Design Certification Application RAI No, 103 Supplement 1," March 19, 2009.
2. Letter, Ronnie L. Gardner (AREVA NP Inc.) to Document Control Desk (NRC), "Response to Third Request for Additional Information Regarding ANP-10281P, 'U.S. EPR Digital Protection System Topical Report' (TAC MD 4977)," NRC:09:033, March 31, 2009.