

March 4, 2009

Mr. Ronnie L. Gardner  
AREVA NP Inc.  
3315 Old Forest Road  
P.O. Box 10935  
Lynchburg, VA 24506-0935

SUBJECT: THIRD REQUEST FOR ADDITIONAL INFORMATION REGARDING  
ANP-10281P, "U.S. EPR DIGITAL PROTECTION SYSTEM TOPICAL REPORT"  
(TAC MD4977)

Dear Mr. Gardner:

By letter dated March 27, 2007 (Agencywide Documents Access and Management System [ADAMS] Accession Number ML070880784), AREVA NP (AREVA) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Topical Report (TR) ANP-10281P, "U.S. EPR Digital Protection System Topical Report," (ML070880831 [proprietary] and ML070880801 [non-proprietary]). The staff has submitted two requests for additional information dated June 22, 2007 (ML071700068), October 4, 2007 (ML072690060), and received responses to these questions by letters from AREVA dated August 21, 2007 (ML072360476), and December 3, 2007 (ML073410604). The questions in the enclosure have been the subject of a records audit at AREVA's Rockville records center on October 8, 2008, and remain outstanding.

A draft of this request for additional information (RAI) was provided to you on December 12, 2008 (ML083470830), and discussed with your staff in a public meeting on January 15, 2009. One additional question (RAI-40), which was provided to you on February 13, 2009 and discussed with you on February 19, 2009, has been included. In order to continue to support the U.S. EPR Design Certification schedule, AREVA's responses to these questions need to be received by March 31, 2009.

If you have any questions regarding this matter, I may be reached at 301-415-3361.

Sincerely,

*/RA/*

Getachew Tesfaye, Sr. Project Manager  
EPR Projects Branch  
Division of New Reactor Licensing  
Office of New Reactors

DOCKET 52-020  
Project 733  
Enclosure: Third Request for Additional Information

cc: DC AREVA - EPR Mailing List

DC AREVA - EPR Mailing List  
cc:

(Revised 02/23/2009)

Mr. Glenn H. Archinoff  
AECL Technologies  
481 North Frederick Avenue  
Suite 405  
Gaithersburg, MD 20877

Mr. Gary Wright, Director  
Division of Nuclear Facility Safety  
Illinois Emergency Management Agency  
1035 Outer Park Drive  
Springfield, IL 62704

Ms. Michele Boyd  
Legislative Director  
Energy Program  
Public Citizens Critical Mass Energy  
and Environmental Program  
215 Pennsylvania Avenue, SE  
Washington, DC 20003

Dr. Charles L. King  
Licensing Manager, IRIS Project  
Westinghouse Electric Company  
Science and Technology Department  
20 International Drive  
Windsor, CT 06095

Ms. Sherry McFaden  
Framatome NP, Inc.  
3315 Old Forest Road, OF-16  
Lynchburg, VA 24501

Mr. Steve Seitz  
AREVA  
100 Dean Road  
East Lyme, CT 06333

Mr. Tom Sliva  
7207 IBM Drive  
Charlotte, NC 28262

Mr. Robert E. Sweeney  
IBEX ESI  
4641 Montgomery Avenue  
Suite 350  
Bethesda, MD 20814

## DC AREVA - EPR Mailing List

### Email

alex.miller@hse.gsi.gov.uk (Alex Miller)  
APH@NEI.org (Adrian Heymer)  
awc@nei.org (Anne W. Cottingham)  
bob.brown@ge.com (Robert E. Brown)  
BrinkmCB@westinghouse.com (Charles Brinkman)  
carey.fleming@constellation.com (Carey Fleming)  
chris.maslak@ge.com (Chris Maslak)  
cwaltman@roe.com (C. Waltman)  
david.hinds@ge.com (David Hinds)  
david.lewis@pillsburylaw.com (David Lewis)  
dlochbaum@UCSUSA.org (David Lochbaum)  
erg-xl@cox.net (Eddie R. Grant)  
gcesare@enercon.com (Guy Cesare)  
greshaja@westinghouse.com (James Gresham)  
james.beard@gene.ge.com (James Beard)  
james.p.mcquighan@constellation.com (Jim McQuighan)  
jason.parker@pillsburylaw.com (Jason Parker)  
jgutierrez@morganlewis.com (Jay M. Gutierrez)  
jim.riccio@wdc.greenpeace.org (James Riccio)  
JJD1@nrc.gov (John Donohue)  
JINesrsta@cpsenergy.com (James J. Nesrsta)  
John.O'Neill@pillsburylaw.com (John O'Neill)  
Joseph\_Hegner@dom.com (Joseph Hegner)  
junichi\_uchiyama@mnes-us.com (Junichi Uchiyama)  
KSutton@morganlewis.com (Kathryn M. Sutton)  
kwaugh@impact-net.org (Kenneth O. Waugh)  
lchandler@morganlewis.com (Lawrence J. Chandler)  
Marc.Brooks@dhs.gov (Marc Brooks)  
maria.webb@pillsburylaw.com (Maria Webb)  
mark.beaumont@wsms.com (Mark Beaumont)  
matias.travieso-diaz@pillsburylaw.com (Matias Travieso-Diaz)  
mbowling@numarkassoc.com (Marty Bowling)  
media@nei.org (Scott Peterson)  
mike\_moran@fpl.com (Mike Moran)  
MSF@nei.org (Marvin Fertel)  
mwetterhahn@winston.com (M. Wetterhahn)  
nirsnet@nirs.org (Michael Mariotte)  
patriciaL.campbell@ge.com (Patricia L. Campbell)  
paul.gaukler@pillsburylaw.com (Paul Gaukler)  
Paul@beyondnuclear.org (Paul Gunter)  
pshastings@duke-energy.com (Peter Hastings)  
RJB@NEI.org (Russell Bell)  
RKTemple@cpsenergy.com (R.K. Temple)  
Ronda.pederson@areva.com (Ronda Pederson)

DC AREVA - EPR Mailing List

rrsgarro@pplweb.com (Rocco Sgarro)  
russell.wells@areva.com (Russell Wells)  
sabinski@suddenlink.net (Steve A. Bennett)  
sandra.sloan@areva.com (Sandra Sloan)  
sfrantz@morganlewis.com (Stephen P. Frantz)  
steven.hucik@ge.com (Steven Hucik)  
tkkibler@scana.com (Tria Kibler)  
tlharpster@pplweb.com (Terry Harpster)  
tom.miller@hq.doe.gov (Tom Miller)  
trsmith@winston.com (Tyson Smith)  
Vanessa.quinn@dhs.gov (Vanessa Quinn)  
VictorB@bv.com (Bill Victor)  
vijukrp@westinghouse.com (Ronald P. Vijuk)  
Wanda.K.Marshall@dom.com (Wanda K. Marshall)  
wayne.marquino@ge.com (Wayne Marquino)  
whorin@winston.com (W. Horin)

March 4, 2009

Mr. Ronnie L. Gardner  
AREVA NP Inc.  
3315 Old Forest Road  
P.O. Box 10935  
Lynchburg, VA 24506-0935

SUBJECT: THIRD REQUEST FOR ADDITIONAL INFORMATION REGARDING  
ANP-10281P, "U.S. EPR DIGITAL PROTECTION SYSTEM TOPICAL REPORT"  
(TAC MD4977)

Dear Mr. Gardner:

By letter dated March 27, 2007 (Agencywide Documents Access and Management System [ADAMS] Accession Number ML070880784), AREVA NP (AREVA) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Topical Report (TR) ANP-10281P, "U.S. EPR Digital Protection System Topical Report," (ML070880831 [proprietary] and ML070880801 [non-proprietary]). The staff has submitted two requests for additional information dated June 22, 2007 (ML071700068), October 4, 2007 (ML072690060), and received responses to these questions by letters from AREVA dated August 21, 2007 (ML072360476), and December 3, 2007 (ML073410604). The questions in the enclosure have been the subject of a records audit at AREVA's Rockville records center on October 8, 2008, and remain outstanding.

A draft of this request for additional information (RAI) was provided to you on December 12, 2008 (ML083470830), and discussed with your staff in a public meeting on January 15, 2009. One additional question (RAI-40), which was provided to you on February 13, 2009 and discussed with you on February 19, 2009, has been included. In order to continue to support the U.S. EPR Design Certification schedule, AREVA's responses to these questions need to be received by March 31, 2009.

If you have any questions regarding this matter, I may be reached at 301-415-3361.

Sincerely,

*/RA/*

Getachew Tesfaye, Sr. Project Manager  
EPR Projects Branch  
Division of New Reactor Licensing  
Office of New Reactors

DOCKET 52-020  
Project 733  
Enclosure: Third Request for Additional Information

cc: DC AREVA - EPR Mailing List

DISTRIBUTION:

PUBLIC TJackson, NRO  
NARP R/F DSpaulding, NRO  
MCanova, NRO RidsOgcMailCenterResource  
JMcLellan, NRO RidsAcrcAcnwMailCenterResource  
GTesfaye, NRO RidsRgn2MailCenterResource  
JColaccino, NRO RidsNroDNRLResource  
MKhanna, NRO RidsNroDNRL/NARPRResource

ADAMS ACCESSION NO.: **ML090230140**

**NRO-002**

OFFICE	DNRL/NARP:PM	DNRL/NARP:LA	DE/ICE1:BC	DNRL/NARP:PM
NAME	MCanova	JMcLellan	TJackson	GTesfaye
DATE	02/24/09	02/24/09	03/04/09	03/04/09

THIRD REQUEST FOR ADDITIONAL INFORMATION (RAI)

ANP-10281P, "U.S. EPR DIGITAL PROTECTION SYSTEM

TOPICAL REPORT" (TAC NO. MD4977)

DOCKET NO. 52-020

- RAI-37. Demonstrate that the U.S. EPR digital protection system (PS) design and architecture for providing self powered neutron detector (SPND) measurements between the remote acquisition units (RAU) and certain acquisition and processing units (APU) are not susceptible to single failure as required by General Design Criterion (GDC) 21 of Title 10 of the Code of Federal Regulations (CFR) 50, Appendix A.

GDC 21 states, in part, that the protection system shall be designed for high functional reliability and inservice testability commensurate with the safety functions to be performed. Redundancy and independence designed into the protection system shall be sufficient to assure that (1) no single failure results in loss of the protection function and (2) removal from service of any component or channel does not result in loss of the required minimum redundancy unless the acceptable reliability of operation of the protection system can be otherwise demonstrated. Section 6.3 of the U.S. EPR Digital Protection System Topical Report discusses the RAU-APU architecture. This section states that the measurements from the SPNDs are required for processing by the APU within each division of the U.S. EPR digital protection system (PS). While the RAU in each division only acquires one-fourth of the SPND measurements, all 72 measurements are required by the APU in each division to accurately compute the 3-D power distribution. Therefore, communication from the RAU to the APU is established to satisfy this requirement. The RAU – APU architecture consists of five redundant ring topology networks. The first four networks each connect the RAU 1 of all four divisions to two APUs in one division. The fifth network connects the RAU 2 of the four divisions to the APU in the four divisions. Therefore, the fifth network is redundant to the first four networks collectively.

Provide information to demonstrate how GDC 21 is met. Specifically, given that when RAU1 within a division is removed from service and RAU2 within the same division has a single failure, demonstrate how the protective functions provided by the SPND measurements continue to be accomplished. Describe how many SPND measurements out of the 72 total measurements are required to complete the required protective function. In addition, provide a detailed description of the method by which the multiple measurements are used to arrive at the estimated power level and the method for determining the uncertainty in the measured power level. Include in the analyses the assumptions employed regarding the ability of the digital network to reliably acquire and transfer information, including timing considerations.

- RAI-38. Describe the failure modes of the ring communications network employed in the U.S. EPR digital protection system (PS) to provide self powered neutron detector measurements (SPND) between the remote acquisition units (RAU) and certain

acquisition and processing units (APU) as required by General Design Criterion (GDC) 23 of 10 CFR 50, Appendix A.

GDC 23 states, in part, that the protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure, steam, water, and radiation) are experienced.” Section 6.3 of the U.S. EPR Digital Protection System Topical Report discusses the RAU-APU architecture. This section states that the measurements from the SPNDs are required for processing by the APU within each division of the PS. While the RAU in each division only acquires one-fourth of the SPND measurements, all 72 measurements are required by the APU in each division to accurately compute the 3-D power distribution. Therefore, communication from the RAU to the APU is established to satisfy this requirement. The RAU – APU architecture consists of five redundant ring topology networks. The first four networks each connect the RAU1 of all four divisions to two APUs in one division. The fifth network connects the RAU2 of the four divisions to the APU in the four divisions. Therefore, the fifth network is redundant to the first four networks collectively.

Describe how the system design of the APU can accommodate failure (e.g., loss of signal, or loss of confidence in signal) of any one of the first four ring networks (those connected to RAU1). Specifically, describe the methods used by the APU to detect the validity of the SPND measurements, and how measurements acquired from the redundant fifth network are used to provide the estimated power level.

- RAI-39. Justify how the three typical implementations of manual system level actuation address IEEE Std. 603-1991, Criteria 5.14 and 6.2.1 and the guidance of Branch Technical Position (BTP) 7-19 and Regulatory Guide (RG) 1.62.

10 CFR 50.55a(h) endorses IEEE Std. 603-1991 as part of the regulations. IEEE Std. 603-1991, Criterion 6.2.1, states that means shall be provided in the control room to implement manual initiation at the division level of the automatically initiated protective actions. The means provided shall minimize the number of discrete operator manipulations and shall depend on the operation of a minimum of equipment. The staff guidance for addressing this requirement is provided in RG 1.62, Position 4, which states that equipment common to both manual and automatic initiation should be kept to a minimum. Additionally, acceptance criteria in BTP 7-19 of NUREG-0800, Standard Review Plan, states that a set of displays and controls located in the main control room should be provided for manual system-level actuation of critical safety functions and for monitoring of parameters that support safety functions. The displays and controls should be independent and diverse from the computer-based safety systems. Finally, IEEE Std. 603-1991, Criterion 5.14, states, in part, that human factors shall be considered at the initial stages and throughout the design process.

In the NRC staff's second request for additional information (RAI) of the U.S. EPR Digital Protection System (PS) Topical Report, RAI 18, requested the applicant describe the implementation of each manual system level actuation of engineered safety features (ESF) functions. In response, the applicant provided three typical

implementations of ESF functions. Additionally, in the response to RAI 18, the applicant states since the submittal of the PS Topical Report, regulatory developments in the area of D3 (e.g., interim staff guidance, statements made by the staff in the transcript for the September 13, 2007, ACRS Digital I&C System Subcommittee meeting) have indicated that component level controls implemented through a diverse, non-safety related system are adequate to satisfy BTP 7-19. The staff finds this response inadequate since the final recommendation within the interim staff guidance (Digital I&C-ISG-02 "Diversity and Defense-in-Depth [D3]"), as referred to by the applicant, states:

"In addition to the above, a set of displays and controls (safety or non-safety) should be provided in the main control room for manual system level actuation and control of safety equipment to manage plant critical safety functions, including reactivity control, reactor core cooling and heat removal from the primary system, reactor coolant system integrity, and containment isolation and integrity. The displays and controls should be independent and diverse from the RPS discussed above. However, these displays and controls could be those used for manual operator action as described above. Where they serve as backup capabilities, the displays and controls should also be able to function downstream of the lowest-level software-based components subject to the same common cause failure (CCF) that necessitated the diverse backup system; one example would be the use of hard-wired connections."

This ISG does not stipulate component level controls from a diverse non-safety system are adequate in satisfying BTP 7-19, Position 4. Furthermore, the proposed manual actuation means appears to use large portions of the automatic actuation equipment without adequate consideration for limiting common equipment. Finally, the topical report did not address all manual actuation methods in the control room and how human factors are considered in the proposed design. The staff requests the applicant to demonstrate how Criteria 5.14 and 6.2.1 of IEEE Std. 603-1991, Position 4 of BTP 7-19, Digital I&C ISG-02, as well as Regulatory Position 4 of RG 1.62, have been addressed in the three typical implementations of ESF actuation within the Digital Protection System.

- RAI-40. Applicant should request use of an alternative to 10 CFR 50.55a(h), as outlined in the requirements in 10 CFR 50.55a(a)(3), to address the use of IEEE Std. 603-1998 instead of IEEE Std. 603-1991.

10 CFR 50.55a(h) incorporates by reference IEEE Std. 603-1991, including the correction sheet dated January 30, 1995. Section 14.1 of Topical Report ANP-10281, U.S. EPR Digital Protection System, Revision 0, states the following: "Accordingly, AREVA NP's position is that compliance with IEEE Std. 603-1998 constitutes compliance with IEEE Std. 603-1991, and therefore, satisfies the requirement contained in 10 CFR 50.55a(h)." While the staff understands the technical basis for using IEEE Std. 603-1998, in order to comply with the regulation, AREVA NP will need to request the use of an alternative edition of IEEE Std. 603-1998 per 10 CFR 50.55a(a)(3). Appropriate revision to the U.S. EPR FSAR Section 7.1 should also be made to acknowledge the request made per 10 CFR 50.55a(a)(3).