ATTACHMENT 2

Response to
NRC Reactor Systems Branch
Request for Additional Information
Regarding Extended Power Uprate
License Amendment Request

NON-PROPRIETARY VERSION

(Cover page plus 16 pages)

Controlled Document

ANP-3057(NP)
Revision 0

St. Lucie Unit 1 EPU – Responses to NRC Questions SRXB-58, SRXB-59, and SRXB-60

October 2011

AREVA NP Inc.

AREVA

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ANP-3057(NP)
Revision 0

St. Lucie Unit 1 EPU – Responses to NRC Questions SRXB-58, SRXB-59, and SRXB-60

Nature of Changes

Item	Page	Description and Justification
1.	All	Initial Release

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1.0 Introduction

The Nuclear Regulatory Commission (NRC) staff requested additional information to support the review of the Chemical Volume Control System (CVCS) Malfunction and Inadvertent Operation of the Emergency Core Cooling System (ECCS) section of the St. Lucie Unit 1 extended power uprate (EPU) license amendment request (LAR). This NRC information request is included in the Request for Additional Information (RAI) SRXB-58, SRXB-59 and SRXB-60.

2.0 Responses to Information Request

2.1 *SRXB-58*

Explain the abrupt jump in pressurizer pressure that occurs shortly before 700 seconds. Consider whether the cause could be attributed to code modeling effects.

Response:

The increase in pressurizer pressure during this event is attributed to the pressurizer modeling options as related to the pressurizer design. The pressurizer design (elevation of spray nozzle) and pressurizer modeling choices (control volume equilibrium versus non-equilibrium options) can both have an effect on pressurizer spray condensation efficiency which influences the pressure response during this event.

The condensation efficiency is related to the predicted pressurizer water level. As the pressurizer water level increases, the resident time of the liquid spray flow in the steam environment decreases (shorter time before spray droplets reach the liquid); thus, the effective condensation efficiency decreases. At some point, the pressurizer spray nozzle will become submerged, and the condensation efficiency becomes effectively zero. Once the pressurizer spray condensation becomes effectively zero, it is anticipated that the pressurizer pressure will begin to increase.

Depending on the modeling choices, the pressurizer pressure may increase due to a loss of condensation (as in ANP-3037), or the pressure may remain constant assuming continued condensation until the pressurizer is liquid solid. The actual behavior would lie in between these two cases, with the condensation efficiency decreasing in a more continuous fashion leading to a more gradual pressure increase.

A sensitivity case was performed to evaluate the pressurizer pressure response for St. Lucie Unit 1 CVCS Malfunction event presented in ANP-3037. The pressurizer in the ANP-3037 analysis was modeled with a [

]. A sensitivity case was performed that modeled a [

]. The system response for the

sensitivity case is presented in Figure 1 (pressurizer pressure) and Figure 2 (pressurizer volume). From Figure 1, the [

]. The results demonstrate that the CVCS Malfunction analysis presented in ANP-3037 is bounding.

Figure 1 CVCS Malfunction – Pressurizer Pressure (Sensitivity Case)

Figure 2 CVCS Malfunction – Pressurizer Volume (Sensitivity Case)

2.2 ***SRXB-59***

The CVCS malfunction analysis is said to address the inadvertent ECCS actuation, as well. Show that the CVCS malfunction analysis yields a shorter time interval, available for operator action, when compared to the results of an inadvertent ECCS actuation analysis in which the following assumptions are implemented (in order to cause a rapid filling of the pressurizer):

a. Assumed inoperability of pressurizer spray, since it is not a safety-related system

b. Pressurizer PORVs are available

c. Reactor trip is actuated, due to receipt of the SI signal or opening of the PORVs, or another cause (to shift heat removal to safety-related mitigation systems, only)

d. Unavailability of non safety-related systems, in the secondary system, for decay heat removal – i.e., heat is removed through the steam generator safety valves

e. Assumption of the worst single failure in the auxiliary feedwater system.

2.3 ***SRXB-60***

Document the results as a comparison, to verify that the limiting case has been identified. Alternatively, provide separate analyses for the inadvertent ECCS actuation and the CVCS malfunction events.

Response to SRXB-59 and SRXB-60:

A sensitivity study was performed to confirm that the limiting case for St. Lucie Unit 1 CVCS Malfunction event and Inadvertent ECCS Actuation event has been identified. An Inadvertent Safety Injection Actuation Signal (SIAS) causes the high pressure and low pressure safety injection (HPSI) pumps and charging pumps to start; however, since the RCS pressure during the event remains above the shutoff head of the high and low pressure safety injection pumps, an inadvertent SIAS causes only the charging pumps to inject. Thus, the injection into the RCS for both the CVCS Malfunction and Inadvertent ECCS Actuation events at St. Lucie Unit 1 is the same and is from the charging pumps only.

The sensitivity study case matrix is presented in Table 1, which lists the cases performed to evaluate the impact of reactor trip on the consequences of this event. A reactor trip was

modeled to occur on high pressurizer pressure as St. Lucie Unit 1 does not have a reactor trip on safety injection actuation signal. Since the shutoff head of the high pressure safety injection pumps is below the RCS pressure during the event, an inadvertent ECCS signal causes the charging pumps to actuate. The consequence, i.e., actuation of the charging pumps, for both the CVCS Malfunction and Inadvertent ECCS Actuation events at St. Lucie Unit 1 is the same.

The sensitivity study results are presented in Table 2. [

] The limiting operator action time from the sensitivity study, based on the time difference between the pressurizer becoming liquid filled and reactor trip or pressurizer level reaching the high level alarm setpoint (whichever is earlier), is [ ], obtained for Case 2. The operator action time for Case 2 is bounded by the operator action time of [ ], presented in ANP-3037. A comparison between the pressurizer pressure and level response for Case 2 and the response presented in ANP-3037 is provided in Figure 3 and Figure 4, respectively. Thus, the analysis presented in ANP-3037 remains bounding.

Table 1 CVCS Malfunction: Sensitivity Study Case Matrix

Table 2 CVCS Malfunction: Sensitivity Study Results

[redacted]

Figure 3 CVCS Malfunction – Pressurizer Pressure Comparison

Figure 4 CVCS Malfunction – Pressurizer Level Comparison

3.0 References

1. EMF-2310(P)(A) Revision 1, *SRP Chapter 15 Non-LOCA Methodology for Pressurized Water Reactors*, Framatome ANP, May 2004.

2. ANP-3037 Revision 0, *St. Lucie Unit 1 EPU – Information to Support NRC Review of CVCS Malfunction*, AREVA NP, September 2011.

ATTACHMENT 3

Response to
NRC Reactor Systems Branch
Request for Additional Information
Regarding Extended Power Uprate
License Amendment Request

AREVA NP
Application for Withholding
Proprietary Information
from Public Disclosure

(Cover page plus 3 pages)

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is Gayle F. Elliott. I am Manager, Product Licensing, for AREVA NP Inc. (AREVA NP) and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by AREVA NP to determine whether certain AREVA NP information is proprietary. I am familiar with the policies established by AREVA NP to ensure the proper application of these criteria.

3. I am familiar with the AREVA NP information contained in the report ANP-3057(P), Revision 0, entitled "St. Lucie Unit 1 EPU – Responses to NRC Questions SRXB-58, SRXB-59, and SRXB-60," dated October 2011 and referred to herein as "Document." Information contained in this Document has been classified by AREVA NP as proprietary in accordance with the policies established by AREVA NP for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by AREVA NP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is

requested qualifies under 10 CFR 2.390(a)(4) "Trade secret and commercial or financial information."

6. The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

(a) The information reveals details of AREVA NP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.

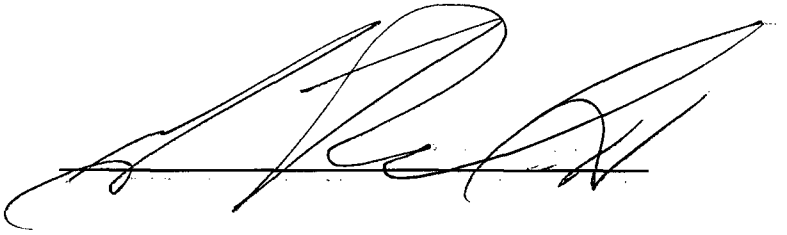
(e) The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

The information in the Document is considered proprietary for the reasons set forth in paragraphs 6(b) and 6(c) above.

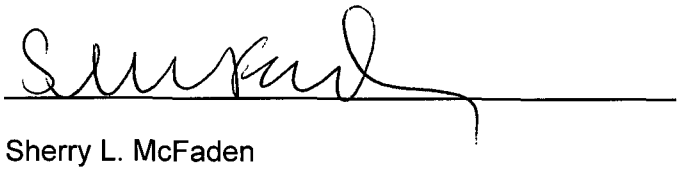
7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document have been made available, on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.



SUBSCRIBED before me this 25th day of October 2011.



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