

**Letter Enclosure Contains Proprietary Information
Withhold in Accordance with 10 CFR 2.390**



Progress Energy

JAN 26 2012

SERIAL: BSEP 12-0018

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit No. 1
Renewed Facility Operating License No. DPR-71
Docket No. 50-325
Submittal of Confirmatory Evaluation for Unit 1 Cycle 19

Reference: Letter from Farideh E. Saba (NRC) to Michael J. Annacone (CP&L),
"Brunswick Steam Electric Plant, Units 1 and 2 – Issuance of Amendments
Regarding Addition of Analytical Methodology Topical Report to Technical
Specification 5.6.5 (TAC Nos. ME3856 and ME3857)," dated April 8, 2011,
ADAMS Accession Number ML111010234

Ladies and Gentlemen:

On April 8, 2011, the U.S. Nuclear Regulatory Commission issued Amendment Nos. 257 and 285 to the Renewed Facility Operating Licenses for the Brunswick Steam Electric Plant (BSEP), Units 1 and 2, respectively. The amendments changed the BSEP, Unit 1 and 2 Technical Specifications to support transition to ATRIUM 10XM fuel and associated core design methodologies. In conjunction with issuance of these amendments, the following license condition was included in Appendix B, "Additional Conditions," of the Operating Licenses for BSEP, Units 1 and 2:

Safety Limit Minimum Critical Power Ratio (SLMCPR), setpoint, and core operating limit values determined using the ANP-10298PA, ACE/ATRIUM 10XM Critical Power Correlation (i.e., TS 5.6.5.b.21), shall be evaluated with methods described in AREVA Operability Assessment CR 2011-2274, Revision 1 to verify the values determined using the NRC-approved method remain applicable and the core operating limits include margin sufficient to bound the effects of the K-factor calculation issue described in AREVA Operability Assessment CR 2011-2274, Revision 1. The results of the evaluation shall be documented and submitted to the NRC, for review, at least 60 days prior to startup of each operating cycle.

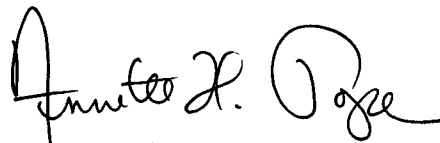
The results of the evaluation specified by the license condition are documented in an AREVA Operability Assessment Report 2011-8616, titled "Operability Assessment (CR #2011-8616)," a copy of which is provided in Enclosure 1. Based on a currently scheduled startup date of April 6, 2012, for the upcoming Unit 1 Cycle 19 refueling outage, submittal of these Unit 1 evaluation results is required by February 6, 2012.

A-001
NRC

This Operability Assessment Report contains information that AREVA considers proprietary, as defined by 10 CFR 2.390. AREVA, as the owner of that proprietary information, has executed the affidavit provided in Enclosure 2 and stated that the identified proprietary information has been handled and classified as proprietary, is customarily held in confidence, and has been withheld from public disclosure. AREVA requests that the identified proprietary information be withheld from public disclosure in accordance with the provisions of 10 CFR 2.390. A non-proprietary version of the AREVA Operability Assessment Report CR #2011-8616 is provided in Enclosure 3.

No regulatory commitments are contained in this letter. Please refer any questions regarding this submittal to Mr. Lee Grzeck, Acting Supervisor - Licensing/Regulatory Programs, at (910) 457-2487.

Sincerely,

A handwritten signature in black ink, appearing to read "Annette H. Pope". The signature is fluid and cursive, with the first name "Annette" being more prominent.

Annette H. Pope
Manager - Support Services
Brunswick Steam Electric Plant

WRM/wrm

Enclosures:

1. AREVA Operability Assessment Report 2011-8616, titled "Operability Assessment (CR #2011-8616)" **(Proprietary Information – Withhold from Public Disclosure in Accordance With 10 CFR 2.390)**
2. AREVA Affidavit Regarding Withholding "Operability Assessment (CR #2011-8616)"
3. Non-Proprietary Version of AREVA Operability Assessment Report 2011-8616, titled "Operability Assessment (CR #2011-8616)"

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cc (with Enclosures 1, 2, and 3):

U. S. Nuclear Regulatory Commission, Region II
ATTN: Mr. Victor M. McCree, Regional Administrator
245 Peachtree Center Ave, NE, Suite 1200
Atlanta, GA 30303-1257

U. S. Nuclear Regulatory Commission
ATTN: Mr. Philip B. O'Bryan, NRC Senior Resident Inspector
8470 River Road
Southport, NC 28461-8869

U. S. Nuclear Regulatory Commission **(Electronic Copy Only)**
ATTN: Mrs. Farideh E. Saba (Mail Stop OWFN 8G9A)
11555 Rockville Pike
Rockville, MD 20852-2738

cc (with Enclosures 2 and 3):

Chair - North Carolina Utilities Commission
P.O. Box 29510
Raleigh, NC 27626-0510

AREVA Affidavit
Regarding Withholding
"Operability Assessment (CR #2011-8616)"

AFFIDAVIT

STATE OF WASHINGTON)
) ss.
COUNTY OF BENTON)

1. My name is Alan B. Meginnis. I am Manager, Product Licensing, for AREVA NP Inc. 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 Operability Assessment for Condition Report 2011-8616, entitled, "Operability Assessment (CR #2011-8616)," 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 secrets 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), 6(d) and 6(e) 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.

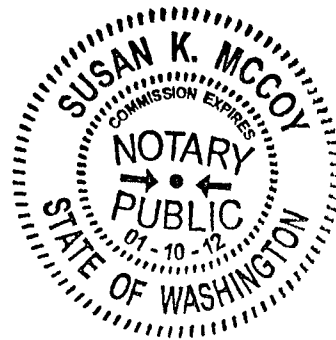
9. The foregoing statements are true and correct to the best of my knowledge,
information, and belief.

Al E. Meyer

SUBSCRIBED before me this 4th
day of January, 2012.

Susan K. McCoy

Susan K. McCoy
NOTARY PUBLIC, STATE OF WASHINGTON
MY COMMISSION EXPIRES: 1/10/12



Non-Proprietary Version of
AREVA Operability Assessment Report 2011-8616,
titled "Operability Assessment (CR #2011-8616)"



OPERABILITY ASSESSMENT

(CR #2011-8616)

Issue Description:

CR2011-2274 identifies an issue with the approved ACE correlation for the ATRIUM™ 10XM* fuel design with regard to the calculation of K-factor within the ACE correlation. [

]

This issue was discussed with the USNRC during the review of a licensing amendment request to add the ATRIUM 10XM version of the ACE correlation to the list of approved COLR references in the Brunswick Technical Specifications. As part of the approval of the licensing amendment (Reference 1), the USNRC imposed the following license condition:

Safety Limit Minimum Critical Power Ratio (SLMCPR), setpoint, and core operating limit values determined using the ANP-10298PA, ACE/ATRIUM 10XM Critical Power Correlation (i.e., TS 5.6.5.b.21), shall be evaluated with methods described in AREVA Operability Assessment CR 2011-2274, Revision 1 to verify the values determined using the NRC-approved method remain applicable and the core operating limits include margin sufficient to bound the effects of the K-factor calculation issue described in AREVA Operability Assessment CR 2011-2274, Revision 1. The results of the evaluation shall be documented and submitted to the NRC, for review, at least 60 days prior to startup of each operating cycle.

This is the operability assessment for Brunswick Unit 1 Cycle 19 and as such addresses impacts on information provided in Reference 2.

References:

1. *Brunswick Steam Electric Plant, Units 1 and 2 – Issuance of Amendments regarding Addition of Analytical Methodology Topical Report to Technical Specification 5.6.5 (TAC Nos. ME3856 and ME3857), MLS No. 111010234, April 8, 2011.*
2. *ANP-3061(P) Revision 0, Brunswick Unit 1 Cycle 19 Reload Safety Analysis, AREVA NP, December 2011.*

Affected Projects

Customer, Reload or Project Identifier	Customer	Reactor (if applicable)
BRK1-19	Progress Energy	Brunswick Unit 1

* ATRIUM is a trademark of AREVA NP.

Assessment:

The USNRC approved ACE correlation was used in Cycle 19 core design and licensing analyses and will be used in the POWERPLEX®-III core monitoring system to ensure Technical Specifications compliance of the fuel operating limits during operation. This assessment addresses the licensing and subsequent monitoring of the Cycle 19 core in regard to the potential impacts of the ACE correlation issue described above.

[

]

These are the same methods previously utilized in the Operability Assessment CR2011-2274 Revision 1 and their use is therefore consistent with the license condition imposed by Reference 1.

Methods Used for Operability Evaluation

In the licensed methodology, a K-factor is determined by [

]

An evaluation version of the ACE correlation was constructed in which the K-factor [

]

Justification of the Evaluation Tool

[

]

[

]

Monitoring During Cycle 19 Operation

The Brunswick Unit 1 Cycle 19 core is composed of the following fuel types:

	<u>Fuel Design</u>	<u>No. Bundles</u>	<u>CPR Correlation</u>
Fresh	ATRIUM 10XM	234	ACE (10XM)
Once-Burnt	ATRIUM-10	242	SPCB
Twice-Burnt	ATRIUM-10	84	SPCB

As noted earlier, the concern identified in the condition reports affects the K-factor calculation within the ACE correlation. This only affects the ATRIUM 10XM fuel in the Cycle 19 core since the co-resident ATRIUM-10 fuel utilizes a different CPR correlation.

Once Cycle 19 begins operation, compliance to the operating limits will be performed using the POWERPLEX®-III core monitoring system which contains the approved version of the ACE correlation.

The nominal design step-through depletion was recalculated with the modified version [] of the ACE correlation in order to evaluate potential non-conservatisms in monitoring during Cycle 19 operation.

[

]

Figure 1 Impact on Core Limiting MFLCPR during Cycle 19

Figure 1 shows that there is no significant non-conservative impact to the limiting CPR margin throughout most of the cycle. [

]

Figure 2 Change in ATRIUM 10XM CPR at Rated Conditions

It is also useful to quantify the impact of the modified correlation on the calculated CPR for the ATRIUM 10XM fuel design (on an absolute Δ MCPR basis). For the same rated power cases, the maximum change in the calculated CPR was determined to be [, as shown in Figure 2. [

]

This evaluation was then expanded to look at a number of off-rated cases to determine if the rated power Δ MCPR results are representative for operation at reduced power conditions. The off-rated cases were performed for a subset of the cycle exposure points presented in Figure 2. The results of this evaluation are

summarized in Figure 3.

The primary results of this off-rated evaluation include:

[

]

Figure 3 Change in ATRIUM 10XM CPR at Rated and Off-Rated Conditions

The off-rated evaluation described above was performed for power levels at and above [

]

[

]

Impact on the Safety Limit MCPR (SLMCPR)

For Cycle 19, the limiting conditions for SLMCPR are [

]

As mentioned previously, the K-factor issue only affects Cycle 19 exposures [

the K-factor [] Therefore, these margins are expected to more than compensate for the change in [] in the SLMCPR analysis.

It should be noted MCPR is monitored relative to the OLMCPR and not directly to the SLMCPR. Therefore, there is no need in this SLMCPR evaluation to [

]

Impact on CPR Operating Limits (OLMCPR)

The licensing analyses result in OLMCPRs that are a combination of power-dependent ($MCPR_p$) and flow-dependent ($MCPR_f$) limits. These are calculated from a series of quasi-steady-state and transient pressurization analyses. The quasi-steady-state events that have the potential to contribute to the $MCPR_p$ limits are the Control Rod Withdrawal Error (CRWE) and the Loss of Feedwater Heating (LFWH).

The $MCPR_f$ limits are based on the quasi-steady-state flow run-up analysis. [

]

The Cycle 19 flow run-up results were reviewed to determine the margin to the MCPR_f limits presented in Reference 2. These results show that for MCPR_f limits above 1.39 (the lowest rated power MCPR limit), the margin to the limit is more than enough to compensate for the K-factor [] in setting the MCPR_f limits and the steady-state CPR monitoring concern.

The MCPR_p limits are a combination of the results from the pressurization analyses, CRWE, and potentially LFWH.

Pressurization Transient Impacts. This K-factor issue []

[] the later cycle pressurization transient analysis results are not significantly affected by this K-factor issue. This was verified with analyses using the modified version of the ACE correlation.

Pressurization transient analyses are also performed []

[] The results of these analyses show that in all cases (including the equipment out of service scenarios) the change in ΔCPR was such that there remains sufficient margin to the MCPR_p limits. The margin is also large enough to account for the MCPR monitoring concern discussed above.

CRWE Impacts. CRWE analyses have been performed using both the as-approved version of the ACE correlation []

[] For the 108% HTSP selected for Cycle 19 operation, the minimum margin to the ATRIUM 10XM MCPR_p curve meets or exceeds the [] at all power levels, as shown below:

	<u>100%P</u>	<u>85%P</u>	<u>65%P</u>	<u>40%P</u>	
ATRIUM 10XM MCPR_p	1.39	1.425*	1.64	1.951*	Table 8.1, Ref. 2
OL $\text{MCPR}_{\text{CRWE}}$	[]	[]	[]	[]	
Margin to MCPR_p	[]	[]	[]	[]	[]

* Values obtained by interpolation

The RBM operability requirements specified in Table 5.11 of Reference 2 are valid for both the as-approved and modified version of the ACE correlation.

LFWH Impacts. The LFWH event is non-limiting with significant margin to the Cycle 19 MCPR_p limits. This was confirmed for Cycle 19 with the performance of cycle-specific calculations using the modified ACE correlation. This calculation verified that the generic LFWH methodology continues to bound the cycle specific results including the impact of the ACE K-factor []. Adequate margin

exists at all power levels to offset the potential monitoring impact of the K-factor []

Summary of MCPR_p impacts: The Reference 2 MCPR_r and MCPR_p limits have sufficient margin to account for the K-factor [] on the Cycle 19 quasi-steady-state and pressurization transient analysis results and the POWERPLEX-III core monitoring system used to verify compliance to these limits.

Impact on Instrumentation Setpoints

The licensing analyses for Cycle 19 support CPR-based instrumentation setpoints for both the Rod Block Monitor (RBM) and for the Oscillation Power Range Monitor (OPRM).

The RBM setpoints are based upon the CRWE event which in turn has been analyzed based on the analytical high power trip setpoints listed in Table 5.10 of Reference 2. Since it was confirmed that the MCPR_p limits continue to bound the CRWE Δ CPR results, the use of the Table 5.10 setpoints continues to be supported for Cycle 19 operation.

The OPRM setpoints are based upon a combination of the cycle-specific DIVOM (Delta over Initial CPR Versus Oscillation Magnitude), the plant-specific HCOM (Hot Channel Oscillation Magnitude), and cycle-specific 2PT (2 recirculation pump trip) results. The cycle-specific DIVOM and 2PT results are the two components of this calculation that are potentially impacted by a CPR correlation error. Two sets of operating limits are reported for each OPRM setpoint, OLMCPR(SS) and OLMCPR(2PT). The DIVOM can impact both OLMCPRs and the 2PT results can only impact the OLMCPR(2PT) results.

DIVOM Impacts: The discussion in the DIVOM approved topical report (BAW-10255PA Revision 2) indicates that the DIVOM analysis is []

] Therefore, there is no DIVOM impact on the

OLMCPR(SS) and OLMCPR(2PT) results.

2PT Impacts: The recirculation pump trip cases provide a ratio of the CPR before and after the 2PT trip. An increase in this ratio will result in an increase in the required MCPR prior to the pump trip, that is OLMCPR(2PT). This evaluation considers both the impact on the selection of the OPRM setpoint and on whether operation with the selected setpoint retains adequate CPR margin to compensate for monitoring the core with the unmodified ACE correlation.

The OLMCPR(SS) and OLMCPR(2PT) values provided in Table 4.3 of Reference 2 []. The use of these setpoints remains supported with the unmodified ACE correlation in the POWERPLEX-III core monitoring system.

Impact on Fuel Loading Error (FLE)

The FLE (misorientation and mislocation) is an infrequent event that is analyzed to assure the off-site dose criteria defined in Section 15.4.7 of NUREG-0800 is not exceeded. []

]

Impact on Loss-of-Coolant Accident (LOCA)

The MCPR of [] associated with the Brunswick ATRIUM 10XM LOCA analysis is based []. The lowest rated power MCPR operating limit for Cycle 19 is 1.39, which is [] higher than the MCPR used in the Brunswick ATRIUM 10XM LOCA analysis. The impact on the monitored MCPR due to the K-factor [] is less than []. Therefore, the results of the Brunswick ATRIUM 10XM LOCA analysis remain applicable for Brunswick Unit 1 Cycle 19.

Conclusion

This evaluation used a combination of calculations and first principal arguments to address the impacts of the ACE correlation concern on planned Brunswick Unit 1 Cycle 19 licensing and operation. The calculations were performed using the modified version of the ACE correlation, [].

The only fuel in the Cycle 19 core that is impacted by the ACE K-factor [] is the fresh ATRIUM 10XM fuel type. The co-resident ATRIUM-10 fuel design is licensed and will be monitored with the SPCB correlation and is therefore not impacted.

This operability assessment has evaluated the potential impact on all CPR related limits or analyses associated with the limits reported in the Reference 2 Reload Safety Analysis report. This evaluation has determined the SLMCPR and corresponding MCPR operating limits remain applicable to Brunswick Unit 1 Cycle 19 operation. The potential impact on the core monitoring system was conservatively addressed and was also found to be bounded by available margins to both the $MCPR_p$ and $MCPR_f$ values.

The $MCPR_p$ limits were set based in part upon the use of the 108% RBM setpoint and this remains supported with the current $MCPR_p$ values. The RBM operability limits were also confirmed to remain applicable for Cycle 19 operation.

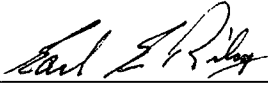




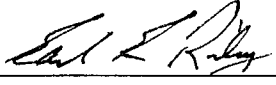
The OPRM setpoints were evaluated using the modified ACE correlation and confirmed to remain applicable for Cycle 19 operation.

The fuel loading error infrequent event was evaluated and it was confirmed that the required offsite dose criteria continues to be met.

There is no impact on the LOCA analysis.

In conclusion, no changes are required in the operating limits or instrument setpoints supplied in the Reference 2 Reload Safety Analysis report. These limits may continue to be used to support operation and monitoring with the current POWERPLEX-III core monitoring system.

APPROVALS:

Approved:		Date:	1-3-2012
	Issue Evaluator – E. E. Riley (Neutronic Design and Analysis)		
Approved:		Date:	1-3-2012
	Issue Evaluator – D. G. Carr (T/H Applications)		
Approved:		Date:	1/3/12
	Peer Review – S. W. Evans (Neutronic Design and Analysis)		
Approved:		Date:	1/3/12
	Peer Review – D. R. Tinkler (T/H Applications)		
Approved:		Date:	1-3-2012
	Peer Review – M. T. Bunker (T/H Codes and Methods)		
Approved:		Date:	1-4-2012
	Issue Owner – E. E. Riley (Neutronic Design and Analysis)		