



RS-16-105

10 CFR 50.90

April 26, 2016

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Supplemental Information in Support of Request for License Amendment
Regarding Transition to AREVA Fuel

- References:
- (1) Letter from Patrick R. Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment Regarding Transition to AREVA Fuel," dated February 6, 2015
 - (2) Letter from U.S. NRC to Bryan Hanson (Exelon Generation Company, LLC), "Dresden Nuclear Power Station, Units 2 and 3 and Quad Cities Nuclear Power Station, Units 1 and 2 – Request for Additional Information Related to the License Amendment Request to Transition to AREVA Fuel (CAC Nos. MF5736, MF5737, MF5738, and MF5739)," dated January 19, 2016
 - (3) Letter from Patrick R. Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Response to Request for Additional Information Regarding Request for License Amendment Regarding Transition to AREVA Fuel," dated January 28, 2016
 - (4) Email from Timothy A. Byam (Exelon Generation Company, LLC) to Russell Haskell (U. S. NRC), "Clarification of Dresden and Quad Cities Fuel Transition RAIs," dated March 31, 2016

In Reference 1, Exelon Generation Company, LLC (EGC) requested an amendment to Renewed Facility Operating License Nos. DPR-19 and DPR-25 for Dresden Nuclear Power Station (DNPS) Units 2 and 3, and Renewed Facility Operating License Nos. DPR-29 and DPR-30 for Quad Cities Nuclear Power Station (QCNPS) Units 1 and 2. The proposed change supports the transition from Westinghouse SVEA-96 Optima2 (Optima2) fuel to AREVA

ATRIUM 10XM fuel at DNPS and QCNPS. Specifically, EGC proposes to revise Technical Specification (TS) 5.6.5, "Core Operating Limits Report (COLR)," paragraph b, to delete no longer used methodologies and to add the AREVA analysis methodologies to the list of approved methods to be used in determining the core operating limits in the COLR. Also, in support of the planned transition to AREVA ATRIUM 10XM fuel, EGC proposes to revise DNPS and QCNPS TS 3.2.3, "Linear Heat Generation Rate (LHGR)," and TS 3.7.7, "The Main Turbine Bypass System."

In Reference 2, the NRC requested that EGC provide additional information to support their review of the subject amendment request (i.e., Reference 1). The requested information was provided in the attachments to Reference 3.

Following their review of the RAI responses provided in Reference 3, the NRC contacted EGC and requested a conference call to obtain clarification on several of the RAI responses provided. Specifically, the reviewers were looking for clarification on the EGC responses to the following four RAIs:

RAI 16
RAI 17
RAI 18a and b
RAI 21b

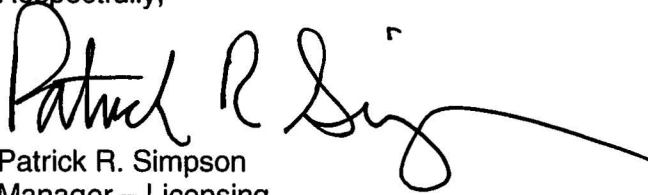
The conference call was conducted on March 2, 2016 and included participants from EGC, AREVA, and the NRC. It was agreed during the call that the requested clarifications for RAIs 17, 18 (partial) and 21b would be provided by email to Russell Haskell (NRC PM). These clarifications were provided in Reference 4. It was also agreed during the March 2, 2016 teleconference call that EGC would provide the remaining RAI response clarifications in a supplement to Reference 1. The requested clarifications are provided in the attachment to this letter.

EGC has reviewed the information supporting a finding of no significant hazards consideration, and the environmental consideration, that were previously provided to the NRC in Attachment 1 of Reference 1. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. In addition, the additional information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter. Should you have any questions concerning this letter, please contact Mr. Timothy A. Byam at (630) 657-2818.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 26th day of April 2016.

Respectfully,

A handwritten signature in black ink, appearing to read "Patrick R. Simpson", with a long horizontal flourish extending to the right.


Patrick R. Simpson
Manager – Licensing

Attachment: RAI Response Clarification for Dresden and Quad Cities Nuclear Power Stations

cc: Regional Administrator- NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT

RAI Response Clarification for Dresden and Quad Cities Nuclear Power Stations

IDENTIFICATION <div style="border: 1px solid black; padding: 5px; text-align: center; font-weight: bold;">FS1-0026562</div>	REVISION <div style="border: 1px solid black; padding: 5px; text-align: center; font-weight: bold;">1.0</div>	<div style="text-align: center;">  </div> <p style="text-align: center;">AREVA Front End BG Fuel BL</p>
TOTAL NUMBER OF PAGES: 6		

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ADDITIONAL INFORMATION:
 ATRIUM 10XM, Exelon, Dresden, Quad Cities

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REVISIONS

REVISION	DATE	EXPLANATORY NOTES
1.0	See 1 st page release date	New document


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REFERENCES

1. ANF-89-98(P)(A), Revision 1 and Supplement 1, "Generic Mechanical Design Criteria for BWR Fuel Designs," Advanced Nuclear Fuels Corporation, May 1995
2. EMF-93-177(P)(A), Revision 1, "Mechanical Design for BWR Fuel Channels," Framatome ANP, August 2005
3. ANP-3305P Revision 1, "Mechanical Design Report for Quad Cities and Dresden ATRIUM 10XM Fuel Assemblies," AREVA Inc., August 2015
4. EMF-2209(P)(A) Revision 3, "SPCB Critical Power Correlation," AREVA NP, September 2009
5. ANP-10298(P)(A) Revision 1, "ACE/ATRIUM 10XM Critical Power Correlation," AREVA, March 2014

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1. INTRODUCTION

The following Clarification of RAI responses provided in the January 28, 2016 letter from Exelon generation Company, LLC (EGC) are provided in response to the NRC request as discussed during the March 2, 2016 teleconference between the U. S. NRC and Exelon. It was agreed that the following clarifications would be provided as a supplement to the license amendment request. The remaining clarifications were provided in an email from Timothy A. Byam (Exelon Generation Company) to Russell Haskell (U. S. NRC), "Clarification of Dresden and Quad Cities Fuel Transition RAIs," dated March 31, 2016.

2. RAIs AND RESPONSES

2.1. RAI-16

2.1.1. CLARIFICATION

The NRC reviewer requested additional detail concerning the mechanical design analyses. A recent AREVA document supporting another US utility customer was provided as an example of the desired level of detail.


2.1.2. AREVA RESPONSE

The AREVA ATRIUM 10XM fuel assembly design has been evaluated by AREVA Inc. and EGC to ensure that the mechanical compatibility with the Dresden Nuclear Power Station (DNPS), Units 2 & 3 and Quad Cities Nuclear Power Station (QCNPS), Units 1 & 2 control blades and in-core instrumentation is in compliance with AREVA's generic mechanical design criteria documents for boiling water reactor (BWR) fuel designs (Reference 1) and fuel channels (Reference 2). Page 1-5 of Reference 2 describes the application of channel deformation in mechanical compatibility evaluations. Analyses are used to verify the mechanical compatibility based on specific bounding physical features and attributes of the fuel assembly as defined in the AREVA detailed design drawings and the dimensional data of the reactor core internals and co-resident fuel assemblies officially transmitted by EGC.

The specific evaluations for the control blade and in-core instrumentation compatibility are provided in the following Table 1. These evaluations are discussed for the applicable fuel component and the corresponding interface on the co-resident fuel assembly and/or in-core component. The conclusion of each evaluation is also provided. Mechanical compatibility and corresponding analyses are further discussed in Reference 3.

Table 1: Control Rod and In-Core Instrumentation Interface Compatibility

AREVA Fuel Assembly Component	In-Core Interface Evaluated	Conclusion
Fuel channel spacers	Axial and lateral interface with co-resident fuel channel spacers throughout the design life	The overlap between the fuel channel spacers is maintained throughout the design life to provide clearance between channels for control rods
	Control rod handle elevation, including scram over-travel	Clearance exists between the fuel channel spacer and the control blade handle at full insertion
Fuel channel fastener	Axial, lateral and radial interface with co-resident fuel channel fastener springs throughout the design life	The fuel channel fastener springs remain in compression and in contact throughout the design life to maintain fuel assemblies in the cell against the upper core guides and to maintain clearance between channels for control rods, including when a fresh AREVA fuel assembly is adjacent to an EOL co-resident fuel assembly
	Control rod handle elevation, including scram over-travel	Clearance exists between the fuel channel fastener and the control blade handle at full insertion
Fuel channel reduced thickness wall section	Control rod roller or pad elevation, including scram over-travel	The control rod rollers and pads remain within the thinned wall section of the Advanced Fuel Channel for maximum control rod clearance
	Lateral interface with control rod roller or pad	
	Control rod roller or pad thickness	Clearance exists throughout the travel of the control blade between fuel channels at BOL and margin to stuck control rod due to channel bow and bulge remains positive throughout the design life
Fuel channel corners	In-core instrumentation tube	Clearance exists throughout the travel of the instrumentation tube between the fuel channel corners

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2.2. RAI-18

2.2.1. CLARIFICATION

Table 18.1 of the response shows that the OPTIMA2 and ATRIUM 10XM assemblies have very different flow characteristics (as shown by the differences in pressure and inlet subcooling). The NRC reviewer asked the following clarifying questions:

- 1. How will Exelon manage and track flow dynamics and Critical Heat Flux in the mixed cores?*
- 2. Please highlight/elaborate on the guidance used in defining the impact on the safety limit minimum CPR determination.*

2.2.2. AREVA RESPONSE

Clarifying Question #1

Table 18.1 shows that the ranges of applicability are different for critical power correlations used for OPTIMA2 and ATRIUM 10XM fuel; particularly for the pressure and inlet subcooling. For all cores (including mixed core configurations), inputs to the codes used to design, license and monitor the core identify the correlation to use in critical power calculations for each fuel assembly. As a result, the critical power correlations are applied on an assembly by assembly basis. This includes checks on the application of the range of applicability of the specific correlation.

Clarifying Question #2

For mixed core configurations of OPTIMA2 and ATRIUM 10XM fuel, two different critical power correlations are used. The SPCB correlation (Reference 4) will be used for the OPTIMA2 fuel and the ACE/ATRIUM 10XM correlation (Reference 5) for the ATRIUM 10XM fuel. The critical power correlations are applied on an assembly by assembly basis in the safety limit minimum CPR analysis. As a result, the ranges of applicability for the critical power correlations are also applied on an assembly by assembly basis.

The core simulator code MICROBURN-B2 is used to model the steady state CPR performance of all the assemblies in the core. Code input identifies the CPR power correlation to use for each assembly. As previously noted, the SPCB correlation will be used for the OPTIMA2 fuel and the ACE/ATRIUM 10XM correlation for the ATRIUM 10XM fuel. The ranges of applicability for the correlations are programmed into the code and checks against the ranges of applicability are made on an assembly by assembly basis. Should a parameter such as mass flux, inlet subcooling, or pressure, fall outside the range of applicability of the correlation for a given assembly, the code is programmed to follow the procedures outlined in Reference 4 Section 2.6 for the SPCB correlation, and Reference 5 Section 5.13 for the ACE/ATRIUM 10XM correlation. The same application and coding of the SPCB and ACE/ATRIUM 10XM correlations are also included in the POWERPLEX core monitoring system. Therefore, the critical power correlations and the associated ranges of applicability are applied on an assembly by assembly basis in the core wide calculations and the core monitoring system.