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Nuclear

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August 8, 2007

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

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: Response to Request for Additional Information Regarding License Amendment Request to Allow Use of AREVA NP Inc. Advanced Mark-BW(A) Fuel Assemblies

References: (1) Letter from K. R. Jury (Exelon Generation Company, LLC) to U. S. NRC, "License Amendment Request and Exemption Requests to Allow Use of AREVA NP Inc. Advanced Mark-BW(A) Fuel Assemblies," dated September 6, 2006

(2) Letter from R. F. Kuntz (U. S. NRC) to C. M. Crane (Exelon Generation Company, LLC), "Braidwood Station, Units 1 and 2 – Request for Additional Information Related to License Amendment Request to Allow Use of AREVA NP Inc. Advanced Mark-BW(A) Fuel Assemblies (TAC Nos. MD3079 and MD3080)," dated May 22, 2007

In the Reference 1 submittal, Exelon Generation Company, LLC (EGC) requested an amendment to Appendix A, Technical Specifications (TS), of Facility Operating License Nos. NPF-72 and NPF-77 for Braidwood Station, Units 1 and 2. The proposed amendment was requested to revise Technical Specification (TS) 4.2.1, "Fuel Assemblies," to allow up to eight AREVA NP Inc. (AREVA), formerly Framatome, modified Advanced Mark-BW fuel assemblies (i.e., Advanced Mark-BW(A) fuel assemblies) containing M5 alloy to be placed in nonlimiting Braidwood Station Unit 1 core regions for evaluation during Cycles 14, 15, and 16, and Safety Limit (SL) 2.1.1, "Reactor Core SLs," to incorporate the peak fuel centerline temperature equations associated with the AREVA NP fuel in SL 2.1.1.3.

The proposed amendment also revises the existing Amendment 122 Additional Condition in the Operating License, Appendix C, "Additional Conditions," to address operation during Cycles 14, 15, and 16 with up to eight AREVA NP Advanced Mark-BW(A) fuel assemblies containing fuel pellets incorporating homogeneous poisons. The license for Braidwood Station Unit 2 is affected only due to the fact that Unit 1 and Unit 2 use common TS.

The Reference 2 letter identified three issues related to the Reference 1 submittal that require additional information. The attachment to this letter provides the EGC response to the NRC request for information discussed during this conference call. In addition, as discussed with the NRC Project Manager for Braidwood Station, EGC has revised the Cycles of applicability for when the Advanced Mark-BW(A) fuel assemblies will be placed in nonlimiting locations of the Braidwood Station Unit 1 core regions.

The Reference 1 submittal proposed evaluation of the assemblies starting with Braidwood Station Unit 1 Operating Cycle 14 and continuing through Operating Cycles 15 and 16 with initial loading during the Fall 2007 refueling outage. EGC has subsequently revised this schedule. The evaluation period will now begin with Braidwood Station Unit 1 Operating Cycle 15, with an initial loading during the Spring 2009 refueling outage and continuing through Operating Cycles 16 and 17. Attachment 2 to this letter provides the revised TS Section 4.0 and Operating License marked-ups. Attachment 3 contains a list of commitments, originally provided in the Reference 1 letter, now updated with the revised operating cycle information.

The information provided in this letter, as well as the change in Operating Cycles of applicability, does not affect the supporting analysis for the original license amendment request as described in Reference 1 submittal. No other information contained in Reference 1 is affected by this additional information. The No Significant Hazards Consideration (NSHC) provided in Attachment 1 of the Reference 1 letter referenced Operating Cycles 14, 15, and 16. The update to Operating Cycles 15, 16, and 17 as well as the additional information provided in this submittal does not affect the conclusions of the NSHC and therefore no changes are required. The Environmental Consideration provided in Attachment 1 of the Reference 1 letter is also not affected by this additional information.

In accordance with 10 CFR 50.91(b), "State consultation," EGC is providing the State of Illinois with a copy of this letter and its attachments to the designated State Official.

If you have any questions about this letter, please contact David Chrzanowski at (630) 657-2816.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of August 2007.

Respectfully,

Darin M Benyak

Darin M. Benyak
Director – Licensing and Regulatory Affairs

Attachments: 1. Response to NRC Request for Additional Information
2. Markup of Proposed Technical Specification Section 4.0 and Operating License
3. List of Revised Regulatory Commitments

ecc: Site Vice President – Braidwood Station
Vice President – Licensing and Regulatory Affairs
Regulatory Assurance Manager – Braidwood Station
Director Licensing and Regulatory Affairs – Midwest
Director Engineering – Braidwood Station
Illinois Emergency Management Agency – Division of Nuclear Safety
Exelon Document Control Desk Licensing (Electronic Copy)
Commitment Tracking Coordinator – Cantera

Attachment 1
Response to NRC Request for Additional Information
Use of AREVA NP Inc. Advanced Mark-BW(A) Fuel Assemblies

NRC Question 1(a):

It is stated that "The advanced Mark-BW (A) fuel pellets may contain homogeneous poisons (i.e., gadolinia (Gd))."

Please clarify whether the fuel pellets in all the test assemblies placed in the core will have Gd homogeneously mixed with UO_2 or fuel assemblies will contain a mixture of UO_2 fuel rods and UO_2-Gd fuel rods.

Exelon Generation Company, LLC (EGC) Response to Question 1(a):

All of the lead assemblies placed in the core will have up to 32 rods with Gd homogeneously mixed with UO_2; this is consistent with past practice for AREVA. The remainder of the rods in each assembly will be UO_2 fuel rods.

NRC Question 1(b):

Please specify the Gd enrichment(s) [i.e., concentration] used in the test assemblies and the associated cutback in U-235 enrichment (if any).

EGC Response to Question 1(b):

The Gd concentration of Gd-bearing rods in the lead assemblies is up to 8 weight % Gd. The use of up to 8 weight % Gd is consistent with NRC-approved topical report BAW-10184P-A, which is Reference 13 of Attachment 1 of the LAR. For rods with Gd, there is a 5% reduction in U-235 weight % for every 1 weight % of Gd. This cutback is consistent with past practice at AREVA.

For example, if the lead assemblies have a 6 weight % Gd concentration, then the Gd rods have a U-235 weight % cutback of 30% from that in the $U0_2$ rods. If the $U0_2$ rods are enriched to 4.00 weight % U-235, then the Gd-bearing rods would be enriched to 2.80 weight % U-235 . Please note that these are nominal (not as-built) values.

NRC Question 1(c):

Explain the impact of Gd content in the fuel on (i) fuel centerline temperature, and (ii) LOCA analyses.

EGC Response to Question 1(c):

(i) The basis for the AREVA UO_2 fuel centerline melt temperature is given in page I-4 of NRC-approved topical report BAW-10162P-A, which is Reference 12 of Attachment 1 of the license amendment request (LAR). The basis for the Gd_2O_3 fuel centerline melt temperature is given in page 2-7 of NRC-approved topical report BAW-10184P-A, which is Reference 13 of Attachment 1 of the LAR.

EGC Response to Question 1(c) (continued):

The reason for the difference is that Reference 12 (for UO_2 fuel) uses a value of 2.02 for the Uranium to Oxygen ratio, while Reference 13 (for Gd_2O_3 fuel) uses a value of 2.00 for this ratio. If the same ratio is used, then the centerline melt temperature for Gd_2O_3 fuel equals that for UO_2 fuel.

(ii) For rods with Gd, there is a 5% reduction in U-235 weight % for every 1 weight % of Gd. This cutback is consistent with past practice at AREVA, and is used to show that the Gd rods are non-limiting for LOCA, when compared to the non-Gd rods in the same assembly.

NRC Question 2:

It is indicated in Attachment 1 that "up to eight AREVA Mark-BW(A) fuel assemblies will be placed in non-limiting regions of the core." Does this mean that these test assemblies will be subjected to normal core operating conditions and these assemblies will yield a representative behavior of the fuel under normal operating conditions?

EGC Response to Question 2:

As indicated in the LAR, the margin between the lead Westinghouse assembly and the AREVA lead assemblies for each burnup step for each of F_Q, $F_{\Delta H}$, and average assembly power will be at least 5% (i.e., the lead Westinghouse assembly will have at least 5% greater peaking factors and powers than the AREVA lead assemblies at each burnup step). Other than this designed margin in peaking factors and power, the AREVA lead assemblies will be subject to the normal core operating conditions.

NRC Question 3:

On Page 7, the last sentence of paragraph 4, clarify and explain the sentence "For the core physics model and most other cases, fuel geometry information for the AREVA Advanced Mark-BW(A) fuel assemblies will be used to ensure modeling fidelity." What are most other cases? Explain how the geometry information will be used "to ensure modeling fidelity."

EGC Response to Question 3:

AREVA fuel geometry information will be transferred to Westinghouse and will be used as part of the core physics model for Braidwood Unit 1 Cycle 15 in the Alpha-Phoenix-ANC code package. The cycle core physics model and/or data from the model will be used per the standard methods for Braidwood in T.S. 5.6.5.b (COLR analytical methods) and the UFSAR to confirm the inputs (Reload Safety Analysis Checklist) to the safety analyses, confirm the fuel rod design limits are met, generate the BEACON model and core operations data, generate the COLR, and to perform confirmatory analyses as described in the LAR to demonstrate that the AREVA lead assemblies are bounded by the Westinghouse Analyses of Record (the safety analyses).

Attachment 2

BRAIDWOOD STATION
UNITS 1 and 2

Docket Nos. STN 50-456 and STN 50-457

License Nos. NPF-72 and NPF-77

Response to Request for Additional Information Regarding
License Amendment Request and Exemption Requests to Allow Use of
Modified Framatome ANP, Inc. Advanced Mark-BW Fuel Lead Test Assemblies

Markup of Proposed Technical Specification Section 4.0 and Operating License

4.0 DESIGN FEATURES

4.1 Site

4.1.1 Site Location

The site is located in Reed Township, approximately 20 mi (32 km) south-southwest of the city of Joliet in northern Illinois.

4.1.2 Exclusion Area Boundary (EAB)

The EAB shall not be less than 1591 ft (485 meters) from the outer containment wall.

4.1.3 Low Population Zone (LPZ)

The LPZ shall be a 1.125 mi (1811 meter) radius measured from the midpoint between the two reactors.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy or ZIRLO clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods or vacancies for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

4.2.2 Control Rod Assemblies

The reactor core shall contain 53 control rod assemblies. The control material shall be silver indium cadmium, hafnium, or a mixture of both types.

Up to 8 Framatome ANP modified Advanced Mark-BW fuel assemblies containing M5 alloy may be placed in nonlimiting Unit 1 core locations for evaluation during Cycles 15, 16, and 17.

ADDITIONAL CONDITIONS

FACILITY OPERATING LICENSE NO. NPF-77

The licensee shall comply with the following conditions on the schedules noted below:

Amendment Number	Additional Condition	Implementation Date
113	The licensee shall implement modifications as discussed in Section 5.11.9 of the Safety Evaluation to maintain the stability of the Braidwood transmission grid including a reduction in the existing local breaker backup time settings.	Prior to implementation of full power up-rate conditions
113	The licensee shall submit to the NRC a confirmatory analysis using a model acceptable to the NRC justifying the value of 8.5 hours for the time of switchover to hot leg injection following a loss-of-coolant accident (Safety Evaluation Section 3.1.3); or recalculate the switchover time using the currently accepted methodology.	Submit by June 1, 2002
113	The licensee shall make the instrumentation changes as described in Section 4.15.2 of the Safety Evaluation.	Prior to implementation of full power up-rate conditions
122	The safety limit equation specified in TS 2.1.1.3 regarding fuel centerline melt temperature (i.e., less than 5080 °F, decreasing by 58 °F per 10,000 MWD/MTU burnup as described in WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995) is valid for uranium oxide fuel without the presence of poisons mixed homogeneously into the fuel pellets. If fuel pellets incorporating homogeneous poisons are used, the topical report documenting the fuel centerline melt temperature basis must be reviewed and approved by the NRC and referenced in this license condition. TS 2.1.1.3 must be modified to also include the fuel centerline melt temperature limit for the fuel with homogeneous poison.	With implementation of the amendment

During operation in Cycles 15, 16, and 17, up to eight (8) Framatome ANP modified Advanced Mark-BW fuel assemblies containing fuel pellets incorporating homogeneous poisons may be placed in nonlimiting Unit 1 core locations provided the fuel cycle designs are developed such that the Westinghouse fuel using the TS 2.1.1.3 Safety Limit bounds the Framatome ANP fuel. The design basis for the Framatome ANP fuel rod centerline melt follows that given in BAW-10162P-A, "TACO3 – Fuel Pin Thermal Analysis Computer Code," October 1989, and BAW-10184P-A, "GDTACO – Urania Gadolinia Fuel Pin Thermal Analysis Code," February 1995.

Attachment 3

BRAIDWOOD STATION
UNITS 1 and 2

Docket Nos. STN 50-456 and STN 50-457

License Nos. NPF-72 and NPF-77

License Amendment Request and Exemption Requests to Allow Use of
AREVA NP Inc. Advanced Mark-BW(A) Fuel Lead Assemblies

List of Revised Regulatory Commitments

Attachment 3
List of Regulatory Commitments

The following table identifies commitments provided in the original submittal [1] and revised to address the applicable operating cycles.

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	Programmatic (Yes/No)
To provide assurance that the current bounding evaluations performed for Braidwood Station Unit 1 reloads will remain valid the AREVA fuel assemblies being used for Braidwood Station Unit 1 Cycles 15, 16, and 17 will be placed in nonlimiting core regions (i.e., for $F_{\Delta H}$, F_Q, and fuel assembly average power at hot full power normal operating conditions) and the nuclear design of the Braidwood Station Unit 1 Cycles 15, 16, and 17 cores performed by Westinghouse will ensure sufficient margin between the lead Westinghouse fuel assembly and the Advanced Mark-BW(A) assemblies for $F_{\Delta H}$, F_Q, and for fuel assembly average power; these margins will be a minimum of 5%. The reload safety evaluation (RSE) will ensure that: • The applicable reload analysis acceptance criteria continue to be met. • The AREVA fuel assemblies are not placed in locations containing rod cluster control assemblies. • The AREVA fuel assemblies do not have an adverse impact on the co-resident Westinghouse fuel. The Westinghouse fuel will be shown to meet its mechanical and thermal-hydraulic limits as described in the Braidwood Station UFSAR. • Confirmatory analyses demonstrate that the AREVA fuel assemblies satisfy the operating and safety limits established by the current Westinghouse Analysis of Record (AOR).	Prior to operation in Cycles 15, 16, and 17	Yes	No
The AREVA fuel assemblies will meet AREVA's own mechanical and thermal-hydraulic limits per Topical Report BAW-10239(P)(A) and other approved methodologies as discussed in this submittal.	Prior to operation in Cycles 15, 16, and 17.	Yes	No

[1] Letter from K. R. Jury (Exelon Generation Company, LLC) to U. S. NRC, "License Amendment Request and Exemption Requests to Allow Use of AREVA NP Inc. Advanced Mark-BW(A) Fuel Assemblies," dated September 6, 2006