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CENG SM
a joint venture of
Constellation Energy EDF

NINE MILE POINT
NUCLEAR STATION

March 23, 2011

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Document Control Desk

SUBJECT: Nine Mile Point Nuclear Station
Unit No. 2; Docket No. 50-410

Response to Request for Additional Information Regarding Nine Mile Point Nuclear Station, Unit No. 2 – Re: The License Amendment Request for Extended Power Uprate Operation (TAC No. ME1476) – Fuel Storage Criticality Analyses

REFERENCES: (a) Letter from K. J. Polson (NMPNS) to Document Control Desk (NRC), dated May 27, 2009, License Amendment Request (LAR) Pursuant to 10 CFR 50.90: Extended Power Uprate

(b) Letter from R. V. Guzman (NRC) to S. L. Belcher (NMPNS), dated February 9, 2011, Request for Additional Information Regarding Nine Mile Point Nuclear Station, Unit No. 2 – Re: The License Amendment Request for Extended Power Uprate Operation (TAC No. ME1476)

Nine Mile Point Nuclear Station, LLC (NMPNS) hereby transmits revised and supplemental information in support of a previously submitted request for amendment to Nine Mile Point Unit 2 (NMP2) Renewed Operating License (OL) NPF-69. The request, dated May 27, 2009 (Reference a), proposed an amendment to increase the power level authorized by OL Section 2.C.(1), Maximum Power Level, from 3467 megawatts-thermal (MWt) to 3988 MWt.

By letter dated February 9, 2011 (Reference b), the NRC staff requested additional information (RAI) regarding the spent and new fuel storage criticality analyses. Attachment 1 provides the NMPNS response to the RAI. Attachment 2 provides additional markups of NMP2 Technical Specifications required to resolve the RAIs. Attachment 3 (non-proprietary) and Attachment 5 (proprietary) provide the new fuel storage criticality analysis.

A001
NRR

This letter forwards proprietary information in accordance with 10 CFR 2.390. The balance of this letter may be considered non-proprietary upon removal of Attachment 5.

Attachment 5 is considered to contain proprietary information exempt from disclosure pursuant to 10 CFR 2.390. Therefore, on behalf of GE-Hitachi Nuclear Energy Americas LLC (GEH), NMPNS hereby makes application to withhold this attachment from public disclosure in accordance with 10 CFR 2.390(b)(1). An affidavit from GEH detailing the reasons for the request to withhold the proprietary information is provided in Attachment 4.

NMPNS is proposing additional changes to the NMP2 Technical Specifications to resolve NRC questions. These proposed changes are in addition to those provided in the original NMP2 Extended Power Uprate (EPU) License Amendment Request (LAR) submitted in Reference (a). As the changes provide additional restrictions regarding the operation of NMP2, the conclusions of the significant hazards consideration provided in Enclosure 1 of the NMP2 EPU LAR dated May 27, 2009 remain valid; i.e., the changes present no significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

There are no regulatory commitments in this submittal.

Should you have any questions regarding the information in this submittal, please contact John J. Dosa, Director Licensing, at (315) 349-5219.

Very truly yours,

Tlynch

STATE OF NEW YORK :
: **TO WIT:**
COUNTY OF OSWEGO :

I, Thomas A. Lynch, being duly sworn, state that I am the Nine Mile Point Plant General Manager, and that I am duly authorized to execute and file this response on behalf of Nine Mile Point Nuclear Station, LLC. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other Nine Mile Point employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Tlynch

Subscribed and sworn before me, a Notary Public in and for the State of New York and County of Oswego, this 23 day of March, 2011.

WITNESS my Hand and Notarial Seal: Lisa M. Doran
Notary Public

My Commission Expires:

9/12/2013
Date

TAL/STD

Lisa M. Doran
Notary Public in the State of New York
Oswego County Reg. No. 01DO6029220
My Commission Expires 9/12/2013

Attachments:

1. Response to Request for Additional Information Regarding License Amendment Request for Extended Power Uprate Operation

2. Additional Markups of NMP2 Technical Specifications

3. GE-Hitachi Nuclear Energy Americas LLC, NEDO-33636, Nine Mile Point Nuclear Station - Unit 2 Fuel Storage Criticality Safety Analysis of New Fuel Storage Racks – GE14 (Non-Proprietary)

4. GE-Hitachi Nuclear Energy Americas LLC Affidavit Justifying Withholding Proprietary Information

5. GE-Hitachi Nuclear Energy Americas LLC, NEDC-33636P, Nine Mile Point Nuclear Station - Unit 2 Fuel Storage Criticality Safety Analysis of New Fuel Storage Racks – GE14 (Proprietary)

cc: NRC Regional Administrator, Region I
NRC Resident Inspector
NRC Project Manager
A. L. Peterson, NYSERDA (w/o Attachment 5)

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE OPERATION

Nine Mile Point Nuclear Station, LLC
March 23, 2011

ATTACHMENT 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE OPERATION

By letter dated May 27, 2009, as supplemented on August 28, 2009, December 23, 2009, February 19, 2010, April 16, 2010, May 7, 2010, June 3, 2010, June 30, 2010, July 9, 2010, July 30, 2010, October 8, 2010, October 28, 2010, November 5, 2010, December 10, 2010, December 13, 2010, January 19, 2011, January 31, 2011, and February 4, 2011, Nine Mile Point Nuclear Station, LLC (NMPNS) submitted for Nuclear Regulatory Commission (NRC) review and approval, a proposed license amendment requesting an increase in the maximum steady-state power level from 3467 megawatts thermal (MWt) to 3988 MWt for Nine Mile Point Unit 2 (NMP2).

By letter dated February 9, 2011, the NRC staff requested additional information (RAI) regarding the fuel storage criticality analyses. This attachment provides the response to the RAI.

The NRC request is repeated (in italics), followed by the NMPNS response.

RAI #1 from NRC Letter dated February 9, 2011

In letter dated December 13, 2010, the licensee stated that:

> *All fuel assembly types were analyzed using CASMO4 at 4.95% enrichment (including the manufacturing tolerance of ± 0.05% enrichment which is equivalent to the 5.0% enrichment discussed in NMP2 Updated Safety Analysis Report Section 9.1.2.2).*

The above statement appears inadequate to support an enrichment of 5.0%. Analysis at 4.95% with a ± 0.05% tolerance would justify an enrichment of 4.95%. By the same reason, the updated safety analysis report also appears inadequate. Clarify this statement.

The various submittals lack clarity of the licensed enrichment limit. The NMP2 power uprate safety analysis report (PUSAR) Table 2.8-10 specifies 5.0%. PUSAR Table 2.8-10 specifies 4.9%. The letter dated December 13, 2010, specifies 4.95%. What is the enrichment limit justified by analysis? Specify this limit in the Technical Specifications (TSs) in accordance with Title 10 of the Code of Federal Regulations, (10 CFR) Section 50.36.

NMPNS Response

The Updated Safety Analysis Report (USAR), when updated for the NMP2 2001 spent fuel pool rack project, incorrectly updated information from supporting documentation into the USAR. This resulted in the 5.0% enrichment value. The NMP2 Power Uprate Safety Analysis Report (PUSAR) was populated with the same value. The inconsistency between the USAR 5.0% enrichment and the 4.95% analysis enrichment value discussed above was entered into the plant corrective action program and will be corrected as part of the Extended Power Uprate (EPU) design basis reconciliation.

Going forward, the maximum U-235 enrichment limit delineated in the NMP2 USAR will be changed to 4.9 weight percent (w/o) U-235 and is justified by the GE-Hitachi Nuclear Energy Americas LLC (GEH) analysis utilized in the NMP2 EPU License Amendment Request (LAR). The NMPNS letter to the NRC dated July 30, 2010, in the response to NMP2-SRXB-RAI-4, identified that this limit would be incorporated into the NMP2 USAR as part of the implementation for EPU. The letter states:

> "NMPNS will add the GEH criticality analysis utilized in the EPU License Application to Section 9.1.2 of the NMP2 USAR, during the design basis reconciliation for EPU implementation. **This will include incorporation of the GEH analysis assumption of a maximum fuel pellet enrichment of 4.9 weight percent (w/o) U-235. [emphasis added]** This change does not have an impact on the current operation of the SFP [Spent Fuel Pool], because there is no fuel stored in the NMP2 SFP that has an enrichment greater than 4.9 w/o. NMPNS will also retain the Holtec criticality analysis currently in the USAR as the analysis of record demonstrating that earlier fuel types irradiated under pre-EPU conditions are bounded by GE14 fuel."

The NRC requested that NMPNS add limitations to the NMP2 Technical Specifications regarding the maximum fuel enrichment defined in the spent fuel pool criticality analysis. In response to this request, NMPNS proposes to add the following to the NMP2 Technical Specifications:

NMP2 Technical Specification 4.3.1.1.c:

> "Fuel assemblies having a maximum k-infinity of 1.32 in the normal reactor core configuration at cold conditions."

NMP2 Technical Specification 4.3.1.1.d:

> "Fuel assemblies having a maximum U-235 enrichment of 4.9 weight percent."

The values for maximum k-infinity and maximum U-235 enrichment represent the most limiting requirements of both the Holtec and GEH criticality analyses.

The proposed NMP2 Technical Specifications changes are provided in Attachment 2.

RAI #2 from NRC Letter dated February 9, 2011

In letter dated December 13, 2010, the licensee stated that:

> *The current GE14 fuel lattice design satisfies the NMP2 new fuel vault storage criteria outlined in Technical Specification (TS) Section 4.3 provided that the peak, in-core eigenvalue of any constituent fuel lattice, as computed by either the GNF lattice physics codes TGBLA04A or TGBLA06A, does not exceed 1.29.*

However, the PUSAR lists a peak in-core eigenvalue limit of 1.3392. Clarify this discrepancy and specify this limit in the TSs in accordance with 10 CFR 50.36. In addition, provide the in-rack maximum k-effective for new fuel storage determined by analysis and the supporting analysis.

NMPNS Response

The values of 1.29 and 1.3392 for the in-core eigenvalue represent a generic GEH limit and a site-specific limit as discussed below.

In the letter dated December 13, 2010, a peak in-core eigenvalue limit of 1.29 was specified as appropriate for use as the NMP2 new fuel vault storage criteria. This value is conservative with respect to the limit specified in NEDE-24011-P-A-17-US, General Electric Standard Application for Reactor Fuel (GESTAR II), for GE designed new fuel vault storage racks with an interrack spacing greater than 10.50 inches. The racks installed in the NMP2 new fuel vault have an interrack spacing (12.25 inches) that meets this criterion and are therefore generically covered by this limit.

To define the site-specific limit for the in-core eigenvalue, a NMP2 specific analysis is provided in NEDC-33636P, Nine Mile Point Nuclear Station - Unit 2 Fuel Storage Criticality Safety Analysis of New Fuel Storage Racks – GE14, Attachment 5 (proprietary). A non-proprietary version is provided in Attachment 3. This analysis evaluates the rack system using a design basis bundle with a maximum in-core eigenvalue of 1.34 under normal and credible abnormal operation with tolerances and computational uncertainties taken into account. The value of 1.34 was established as the target limit at the beginning of the analysis to bound the limit stated in Table 2.8-10 of the PUSAR of 1.3392. Report NEDC-33636P concludes that the system has a maximum in-rack k-effective of 0.87697.

The NRC requested that NMPNS add a limitation to the NMP2 Technical Specifications regarding the peak in-core eigenvalue of any constituent fuel lattice for the new fuel storage. In response to this request, NMPNS proposes to add the following to the NMP2 Technical Specifications:

NMP2 Technical Specification 4.3.1.2.d:

> "Fuel assemblies having a maximum k-infinity of 1.34 in the normal reactor core configuration at cold conditions."

NMP2 Technical Specification 4.3.1.2.e:

> "Fuel assemblies having a maximum U-235 enrichment of 4.9 weight percent."

The values for maximum k-infinity and maximum U-235 enrichment represent the values assumed in NEDC-33636P, (i.e., a maximum k-infinity of 1.34 and a maximum U-235 enrichment of 4.9 w/o). In addition, these values supersede those presented in Table 2.8-10 of the PUSAR.

The proposed NMP2 Technical Specifications changes are provided in Attachment 2.

RAI #3 from NRC Letter dated February 9, 2011

On page 3 of Attachment 1 of its response dated December 13, 2010, the licensee states that NMP2 added 10 new Holtec Boral spent fuel storage racks in the NMP2 spent fuel pool as part of the Phase I re-rack via a 10 CFR 50.59 evaluation. Afterward, NMP2 performed the Phase II re-rack, similarly using a 10 CFR 50.59 evaluation in support of the modification, which replaced 16 original Boraflex spent fuel storage racks with Holtec Boral racks. The licensee further stated that the new Boral spent fuel storage racks are incorporated into the criticality analysis that has been submitted in support of NMP2's EPU LAR. It is not clear to the NRC staff how the licensee can ensure that the Boral material will continue to perform its intended function in the future. As such, please discuss how the neutron absorber will be monitored and maintained (e.g. use of surveillance program). If a program is utilized, discuss in detail the approach that will be used in the monitoring program, specifically the methods and techniques utilized (e.g., visual, weight, volumetric, surface inspection, neutron attenuation testing), frequency of inspection, sample size, data collection and acceptance criteria.

a. *Please indicate the installation date for new and replacement Boral storage racks.*

b. *Please discuss whether NMP2 utilizes a Boral coupon program for the new and replacement Boral storage racks. If a coupon program is being used, please describe the program. Specifically:*

   i. *Identify the quantity and location of coupons relative to the spent fuel racks.*

   ii. *Describe how the coupons are mounted and whether they are fully exposed to the spent fuel pool water.*

   iii. *Discuss whether any coupons that are removed and inspected using non destructive techniques will be re-inserted in the spent fuel pool for future evaluation.*

   iv. *Indicate whether the Boral racks in the spent fuel pool are vented or not.*

NMPNS Response

The NMP2 monitoring program ensures that the Boral material utilized in the NMP2 spent fuel pool storage racks can continue to perform its function. This program is comprised of coupon inspections and tests, as well as monitoring the results of Boral monitoring programs from other sites or plants, including Nine Mile Point Unit 1, that use Holtec racks of similar material and those with equivalent or greater service times. The program methods, acceptance criteria, frequency of inspection, data collection, and sample size are described below.

The initial Boral spent fuel storage racks were installed in 2001. However, a coupon tree was not installed at that time. A coupon tree with ten coupons representative of the material contained in the spent fuel pool racks installed in 2001 was installed in 2007. At this time, NMPNS does not intend to utilize these coupons since the coupon tree was not installed at the same time as the associated racks.

Additional Boral spent fuel storage racks were installed in 2007. NMP2 has two coupon trees, each with ten coupons, representative of the material contained in the spent fuel pool racks installed in 2007. These coupon trees were installed in 2007. The coupons will be evaluated as follows: (1) visual appearance

(deterioration, corrosion, cracks, and dents); (2) dimensional measurements; (3) specific gravity and density measurements; and (4) Boron-10 (B-10) areal density measurements (via neutron attenuation testing). Of the measurements to be performed on the Boral coupons, the most important are the neutron attenuation measurements (to verify the continued presence of the boron) and the thickness measurement (as an indication of potential swelling). Acceptance criteria for these measurements are as follows:

- A decrease of no more than 5% in Boron-10 content, as determined by neutron attenuation. (This is tantamount to a requirement for no loss in boron within the accuracy of the measurement.)

- An increase in thickness at any point should not exceed 10% of the initial thickness at that point.

The remaining measurement parameters serve a supporting role and will be examined for early indications of the potential onset of Boral degradation that would suggest a need for further attention and possibly a change in measurement schedule. These include visual or photographic evidence of unusual surface pitting, corrosion or edge deterioration or unacceptable weight loss in excess of the measurement accuracy.

A coupon from one of the coupon trees representative of the spent fuel pool racks installed in 2007 is scheduled to be removed in 2012. Following this, a coupon from one of the coupon trees representative of the spent fuel pool racks installed in 2007 will be removed on a ten-year frequency. The schedule of processing coupons is based on a nominal 10-year frequency in accordance with Final License Renewal Interim Staff Guidance LR-ISG-2009-01, Aging Management of Spent Fuel Pool Neutron-Absorbing Materials Other than Boraflex. This schedule would be re-evaluated if degradation of the Boral material is established at NMP2 or through other industry experience.

a. NMP2 was originally partially racked with 16 Boraflex racks. In 2001, the remainder of the pool was racked with ten additional Boral racks supplied by Holtec International. In 2007, a re-rack campaign was performed that replaced the original 16 Boraflex racks in the spent fuel pool with Boral racks supplied by Holtec International. This re-rack campaign was consistent with a commitment that NMPNS made to the NRC as part of the license renewal application. NUREG-1900, Safety Evaluation Report Related to the License Renewal of Nine Mile Point Nuclear Station, Units 1 and 2, contains the following commitment:

> Commitment 36 - The spent fuel rack design that currently utilizes Boraflex for reactivity control in the spent fuel pool will be replaced by a design that utilizes Boral for this function. (The completion date was identified as prior to NMP2 Period of Extended Operation.)

b.i NMP2 has three coupon trees in the spent fuel pool, each with ten coupons. Two of the coupon trees are representative of the material contained in the spent fuel pool racks installed in 2007, and one coupon tree is representative of the material contained in the spent fuel pool racks installed in 2001. The three coupon trees were installed in 2007, including the coupon tree that is representative of the material that was installed in the spent fuel pool racks in 2001. The decision not to install the coupon tree associated with the racks installed in 2001was consistent with the position established by the NRC in a February 16, 1995, letter from L. Kopp (NRC) to K. Singh (Holtec) which states:

> "U.S. Nuclear Regulatory Commission has no current requirement for in-service surveillance on Boral in spent fuel storage racks."

The locations of the coupon trees are not static, their positions change during spent fuel pool optimization. The storage cells surrounding the coupon trees are loaded with freshly-discharged fuel assemblies to the greatest extent possible without conflicting with security dispersal requirements.

b.ii Each coupon is independently attached to the coupon tree. Each coupon tree is suspended in an empty fuel storage location, with the coupons fully exposed to the spent fuel pool water.

b.iii Given the number of available coupons, NMPNS does not plan to reinsert coupons that are removed and inspected.

b.iv The spent fuel pool rack design allows for venting of gases. Venting occurs through small openings at the corners of the Boral sheathing pockets.

RAI #4 from NRC Letter dated February 9, 2011

Please describe how the areal density of the Boral material will be measured (e.g., neutron attenuation) and maintained to prevent an inadvertent criticality. Please include a description of the testing, parameters measured, calculations, and acceptance criteria.

NMNPS Response

The B-10 areal density of the Boral material in a coupon will be measured via neutron attenuation testing. Neutron attenuation measurements are a precise instrumental method of analysis for B-10 content using a non-destructive technique in which the percentage of thermal neutrons transmitted through the panel is measured and compared with pre-determined calibration data. B-10 is the nuclide of principal interest since it is the isotope responsible for neutron absorption in the Boral panel.

The vendor that processes the coupon data uses the Penn State Reactor Laboratory to perform neutron attenuation testing of the Boral coupon samples. Count rates are recorded in the following scenarios:

1. With the neutron beam unblocked (C_{inc})
2. With the neutron beam attenuated by the Boral sample (C_{attn})
3. With the neutron beam background count rate with a sheet of Cadmium (C_{bkg})

Therefore:

Neutron Attenuation = $1-(C_{attn}-C_{bkg})/(C_{inc}-C_{bkg})$

Neutron attenuation is then translated to B-10 areal density by using results from known calibration standards. The acceptance criterion for the B-10 areal density will be a decrease of no more than 5% in Boron-10 content, as determined by neutron attenuation. (This is tantamount to a requirement for no loss in boron within the accuracy of the measurement.)

ATTACHMENT 2

ADDITIONAL MARKUPS OF NMP2 TECHNICAL SPECIFICATIONS

Nine Mile Point Nuclear Station, LLC
March 23, 2011

4.0 DESIGN FEATURES (continued)

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1.2 of the USAR; and

b. A nominal 6.18 inch center to center distance between fuel assemblies placed in the storage racks.

Insert 1

4.3.1.2 The new fuel storage racks are designed and shall be maintained with:

a. $k_{eff} \leq 0.95$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1.1 of the USAR;

b. $k_{eff} \leq 0.98$ with all but one of the non-combustible storage vaults covers in place when optimum moderation (foam, spray, fogging, or small droplets) is assumed; and

c. A nominal 7.00 inch center to center distance between fuel assemblies placed within a storage rack and a nominal 12.25 inch center to center distance between fuel assemblies in adjacent racks.

Insert 2

4.3.2 Drainage

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 329 ft 7 inches.

4.3.3 Capacity

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 4049 fuel assemblies.

INSERTS

Insert 1

4.3.1.1...

c. Fuel assemblies having a maximum k-infinity of 1.32 in the normal reactor core configuration at cold conditions; and

d. Fuel assemblies having a maximum U-235 enrichment of 4.9 weight percent.

Insert 2

4.3.1.2...

d. Fuel assemblies having a maximum k-infinity of 1.34 in the normal reactor core configuration at cold conditions; and

e. Fuel assemblies having a maximum U-235 enrichment of 4.9 weight percent.