

**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 4.**

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**CENG**<sup>SM</sup>

a joint venture of



**Constellation  
Energy**



**NINE MILE POINT  
NUCLEAR STATION**

November 1, 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

License Amendment Request for Extended Power Uprate Operation – Supplemental Information Responding to Open Items from the Review by the Advisory Committee on Reactor Safeguards Subcommittee on Power Uprates and Related NRC Staff Questions (TAC No. ME1476)

**REFERENCE:** (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

By letter dated May 27, 2009 (Reference a), as supplemented, Nine Mile Point Nuclear Station, LLC (NMPNS) proposed an amendment to Nine Mile Point Unit 2 (NMP2) Renewed Operating License (OL) NPF-69 that would increase the power level authorized by OL Section 2.C.(1), Maximum Power Level, from 3467 megawatts-thermal (MWt) to 3988 MWt. The application for the NMP2 extended power uprate (EPU) was subsequently reviewed by the Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on Power Uprates at a meeting held on October 5, 2011. During that meeting, NMPNS indicated that answers to certain ACRS questions (hereafter referred to as open items) would be provided prior to the full ACRS committee review of the NMP2 EPU application, which is scheduled for November 3, 2011.

Attachment 1 to this letter provides the NMPNS responses to the open items, as clarified by the additional information communicated to NMPNS in a conference call with the NRC staff on October 20, 2011. In addition, certain open items and related NRC staff questions indicate the need for NMPNS to: (1) confirm the basis for the EPU environmental qualification, and (2) provide regulatory commitments regarding

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(a) fatigue monitoring and (b) steam dryer analysis during the EPU power ascension. This additional information is provided in Attachments 1 and 2, respectively.

Attachment 4 (proprietary) provides Continuum Dynamics, Inc. (CDI) Technical Memo No. 11-24NP, "Nine Mile Point Velocity Squared Data Analysis," Revision 2 (Proprietary) to support the response to certain open items in Attachment 1. Attachment 4 is considered to contain proprietary information exempt from disclosure pursuant to 10 CFR 2.390. CDI has requested that this document be considered proprietary in its entirety; thus, a non-proprietary version is not provided. Therefore, on behalf of CDI, NMPNS hereby makes application to withhold Attachment 4 from public disclosure in accordance with 10 CFR 2.390(b)(1). The affidavit from CDI detailing the reasons for the request to withhold the proprietary information is provided in Attachment 3.

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,



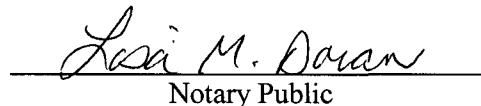
STATE OF NEW YORK :  
: TO WIT:  
COUNTY OF OSWEGO :

I, Ken Langdon, being duly sworn, state that I am Vice President-Nine Mile Point, and that I am duly authorized to execute and file these responses 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.



Subscribed and sworn before me, a Notary Public in and for the State of New York and County of Oswego, this 1 day of November, 2011.

WITNESS my Hand and Notarial Seal:

  
Notary Public

My Commission Expires:

9/12/2013  
Date

KL/JEB

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

Attachments:

1. Responses to Open Items from the Review by the ACRS Subcommittee on Power Upgrades and Related NRC Staff Questions
2. List of Regulatory Commitments
3. Affidavit from Continuum Dynamics, Inc. Justifying Withholding Proprietary Information
4. Continuum Dynamics, Inc. Technical Memo No. 11-24NP, Nine Mile Point Velocity Squared Data Analysis, Revision 2 (Proprietary)

cc: NRC Regional Administrator, Region I  
NRC Resident Inspector  
NRC Project Manager  
A. L. Peterson, NYSERDA (w/o Attachment 4)

**ATTACHMENT 1**

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**RESPONSES TO OPEN ITEMS FROM THE REVIEW BY THE  
ACRS SUBCOMMITTEE ON POWER UPRATES AND  
RELATED NRC STAFF QUESTIONS**

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## ATTACHMENT 1

### **RESPONSES TO OPEN ITEMS FROM THE REVIEW BY THE ACRS SUBCOMMITTEE ON POWER UPRATES AND RELATED NRC STAFF QUESTIONS**

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The following are responses to open items from the review of the Nine Mile Point Unit 2 (NMP2) extended power uprate (EPU) license amendment request by the Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on Power Upgrades, as clarified by the additional information communicated to Nine Mile Point Nuclear Station, LLC (NMPNS) in a conference call with the NRC staff on October 20, 2011. Each open item is stated (in italics), followed by the NMPNS response.

#### **Open Item 1**

*Does the result of 1/8th scale test merely confirm that the existing standpipe/valves do not begin excitation until past EPU conditions? Isn't it also being used in calculating the bump-up factor (BUF) which was used to scale up the load from Current Licensed Thermal Power (CLTP) to EPU conditions? (CDI 08-13P described detailed tests in a 1/8th scale model. It also suggested that NMPNS use a BUF of 1.39 when scaling plant steam line data from CLTP to EPU power.)*

#### **NMPNS Response**

In Section 1.0 of Attachment 13 to the NMP2 EPU license amendment request (NMPNS letter dated May 27, 2009), NMPNS indicated that the NMP2 steam dryer has been evaluated for EPU steam flow conditions consistent with the guidance provided in BWRVIP-182, "Guidance for Demonstration of Steam Dryer Integrity for Power Uprate," issued January 2008, including the response to the NRC request for information in April 2009. The BWRVIP-182 guidelines require screening for acoustic resonances. The guidelines indicate that when no acoustic resonances exist, the expected EPU scaling is main steam line (MSL) velocity squared.

Attachment 13 included a description of the confirmatory 1/8<sup>th</sup> scale test, which was designed to confirm the screening calculations. CDI test report 08-13P includes a summary of the testing results, and an overall conclusion that the results support a bump-up factor (BUF) consistent with velocity squared. Figures 8.1 through 8.8 of CDI test report 08-13P were not designed or intended to represent the demonstration of the velocity squared scaling.

Figure 9.1 of CDI test report 08-13P was revised by the NMPNS response to NMP2-EMCB-SD-RAI-17-S01 submitted by NMPNS letter dated November 5, 2010. The revised Figure 9.1 evaluates the test data in the velocity range applicable for NMP2 EPU. The data show scaling consistent with velocity squared.

A review of the data provided in CDI report 08-13P is documented in CDI Technical Memo TM-11-24P, which is included in Attachment 4 herein. The report shows that the 1/8<sup>th</sup> scale test results in the velocity range for the NMP2 EPU indicate that a velocity squared scaling is appropriate. CDI Technical Memo TM-11-24P includes additional data from the NMP2 plant full scale data and from a similar plant's full scale EPU data. These full scale data provide additional confirming evidence that velocity squared scaling is appropriate in the absence of an acoustic resonance.

## ATTACHMENT 1

### **RESPONSES TO OPEN ITEMS FROM THE REVIEW BY THE ACRS SUBCOMMITTEE ON POWER UPRATES AND RELATED NRC STAFF QUESTIONS**

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#### **Open Item 2**

*Confirm BUF and  $V$  squared ( $V^2$ ) relationship with plant data.*

*According to Dr. Wallis, the data provided in Figure 8.1 of CDI 08-13P reveals that the power law that best fits all the data has an exponent significantly greater than 2. It appears that the BUF can be determined in different ways, leading to a significant variation in the predicted loads on the dryer. The staff or the industry should determine what were the actual BUFs obtained from steam line strain gages in the several plants (e.g., Quad Cities, Vermont Yankee, Susquehanna, and Hope Creek) that have already implemented EPU's similar to NMP2.*

#### **NMPNS Response**

CDI-TM-11-24P (Attachment 4 herein) provides a summary of the NMP2 full scale data and a similar plant's full scale EPU data. In addition, NMP2 has reviewed proprietary information for two other BWR EPU's and confirmed that the scaling for these plants, like the full scale data in Attachment 4, was also bounded by a velocity squared assumption.

#### **Open Item 3**

*The licensee stated that as part of steam dryer modifications, there are plates with 1/8" thickness that will be welded to the inner hood and middle hood, to shift the frequency, such that the hood supports can meet their established 100% stress margin at EPU conditions. The licensee stated that the plates will be welded along three edges, but the bottom edge will not be welded. The licensee did not have a readily available answer for Member Abdel-Khalik's question regarding the length of the unwelded part of this cover plate.*

#### **NMPNS Response**

The statement regarding welding of the 1/8" plates provided at the ACRS subcommittee meeting was incorrect. The current design of the 1/8" hood re-enforcement plate includes a 360 degree weld. There are no unwelded edges.

## ATTACHMENT 1

### RESPONSES TO OPEN ITEMS FROM THE REVIEW BY THE ACRS SUBCOMMITTEE ON POWER UPDATES AND RELATED NRC STAFF QUESTIONS

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#### Open Item 4

*NMPNS used embedded models to obtain more accurate results for alternate stress intensities at high-stress locations. In the embedded model, a small portion of the global model (shell element) including a high stress location is replaced by a solid element mesh, which explicitly models the local welds, if present. The licensee did not have a readily available answer for Member Abdel-Khalik's questions: Are the nodes near the interface between the two regions highly skewed, or are there typically reasonable aspect ratios for the nodes? Are aspect ratios within the allowable limits of the ANSYS code?*

#### NMPNS Response

The nodes near the interface between the global model shell elements and the embedded model solid elements are consistent with ANSYS guidelines. According to the ANSYS basis documents, one particular shape metric predicts whether the quality of the element would affect the numerical solution time and accuracy. The figure of merit is the calculation of the Jacobian ratio at the integration points of the element. At a certain level of the Jacobian ratio, the ANSYS development team determined that the element solution would degrade and produce an unacceptable result. In particular, a Jacobian ratio of 40 was set to be the error level. The ratio of 10 was assigned a warning level. While many other shape metrics are used for the generation of the mesh in the ANSYS Workbench, the Jacobian ratio is the primary metric used to determine the acceptability of the mesh. The Jacobian ratio results for the NMP2 embedded models are as follows.

- NMP2 Embedded Model 1 (SRF = 0.80) - Jacobian ratio 9.3
- NMP2 Embedded Model 2 (SRF = 0.64) - Jacobian ratio 6.6

## ATTACHMENT 1

### **RESPONSES TO OPEN ITEMS FROM THE REVIEW BY THE ACRS SUBCOMMITTEE ON POWER UPRATES AND RELATED NRC STAFF QUESTIONS**

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#### **Open Item 5**

*The licensee's stress analysis procedure is using the concept of "stress reduction factor." In the procedure, the embedded model is analyzed over a reduced frequency range which includes a frequency associated with the dominant stress peak at the selected high stress location. The stress reduction factor is determined by comparing the stresses in the embedded model to the results of the corresponding analysis of the global mode. Then the stress reduction factor is applied to the stresses obtained in the full frequency range using the original global model. The licensee's slide indicated that there are two critical locations: lower lifting rod support bracket weld with  $SRF = 0.64$  and outer hood/hood support/cover plate junction with  $SRF = 0.8$ . Member Abdel-Khalik asked: Where is  $SRF 0.64$  referred to? What is the stress at CLTP?*

#### **NMPNS Response**

The CLTP limiting alternating stress ratios (SR-a) in the global model at the two embedded model locations without the stress reduction factor (SRF) (and without the proposed physical modifications) were 2.26 for the outer hood/hood support/cover plate junction and 2.28 for the lower bracket/lifting rod/vane bank side plate junction.

The embedded model was not used to calculate the SRF without the modification. However, a simplified sub-model technique was employed to determine the benefit of a refined mesh for these two locations without the modifications. The results of the simplified sub-model showed an SRF of approximately 1.0 for both locations.

These results did not become part of the basis for the final design since the analysis supported a conclusion that a modification was required to achieve the desired margin. It follows that the SRF for these two locations is achieved by the modification and is not the result of a refined finite element analysis (FEA) mesh.

## ATTACHMENT 1

### RESPONSES TO OPEN ITEMS FROM THE REVIEW BY THE ACRS SUBCOMMITTEE ON POWER UPRATES AND RELATED NRC STAFF QUESTIONS

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#### Open Item 6

*With respect to an ACRS member question on environmental qualification, the NRC staff requested confirmation of the statements below.*

#### *Inside Containment*

*The increase in integrated dose will cause some components in containment to reach EQ dose limits prior to the end of plant life. These components will be replaced as required prior to end of qualified life in accordance with the EQ program. The remaining components will still have qualified lives beyond the end of plant life.*

#### *Outside Containment*

*The increase in integrated dose will cause some components outside containment to reach EQ dose limits prior to the end of plant life. These components will be replaced as required prior to end of qualified life in accordance with the EQ program. In addition, 17 components will require shielding to be installed to reduce post accident dose to meet EQ program requirements.*

#### NMPNS Response

NMPNS hereby confirms that the above statements are accurate.

**ATTACHMENT 2**

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**LIST OF REGULATORY COMMITMENTS**

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## ATTACHMENT 2

### LIST OF REGULATORY COMMITMENTS

The following table identifies the regulatory commitments in this document. Any other statements in this submittal represent intended or planned actions. They are provided for information purposes and are not considered to be regulatory commitments.

REGULATORY COMMITMENT	DUE DATE																								
In accordance with ASME Section III NB-3200, stress based fatigue monitoring at Nine Mile Point Unit 2 (NMP2) will include all six stress components.	This commitment will apply for the NMP2 period of extended operation, commencing on November 1, 2026.																								
<p>At each 2.5% power ascension test interval during the ascent to EPU conditions from 100% Current Licensed Thermal Power (CLTP), the Acoustic Circuit Model (ACM) 4.1 load definition and a corresponding stress analysis for the top 100 stress locations (known as real time stress analysis) will be determined, and the minimum alternating stress intensity ratio (SR-a) at each of these intervals will be confirmed as follows.</p> <table><tr><th>Power Level (% CLTP)</th><th>Minimum SR-a</th><th>Minimum SR-a</th></tr><tr><td>100</td><td>2.51</td><td>2.76</td></tr><tr><td>102.5</td><td>2.42</td><td>2.63</td></tr><tr><td>105</td><td>2.33</td><td>2.50</td></tr><tr><td>107.5</td><td>2.24</td><td>2.37</td></tr><tr><td>110</td><td>2.16</td><td>2.24</td></tr><tr><td>112.5</td><td>2.08</td><td>2.12</td></tr><tr><td>115</td><td>2.00</td><td>2.00</td></tr></table> <p>Notes</p> <p>1. These criteria establish a variation from velocity squared scaling that could represent a significant trend. If a criterion is exceeded, a review of the results by the Plant Operations Review Committee (PORC) and NRC is required. A power reduction is not required provided that SR-a remains greater than 2.0.</p> <p>2. These criteria establish the expected velocity squared scaling as power is increased. If a criterion is exceeded, an engineering review is required. If the review determines that the variation does not represent a significant deviation in velocity squared scaling, power may be increased to the next test interval.</p> <p>A summary of the stress analysis results will be provided for NRC review at each 5% power test interval.</p>	Power Level (% CLTP)	Minimum SR-a	Minimum SR-a	100	2.51	2.76	102.5	2.42	2.63	105	2.33	2.50	107.5	2.24	2.37	110	2.16	2.24	112.5	2.08	2.12	115	2.00	2.00	During the ascent to EPU conditions from 100% CLTP.
Power Level (% CLTP)	Minimum SR-a	Minimum SR-a																							
100	2.51	2.76																							
102.5	2.42	2.63																							
105	2.33	2.50																							
107.5	2.24	2.37																							
110	2.16	2.24																							
112.5	2.08	2.12																							
115	2.00	2.00																							

**ATTACHMENT 3**

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**AFFIDAVIT FROM CONTINUUM DYNAMICS, INC  
JUSTIFYING WITHHOLDING PROPRIETARY INFORMATION**

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# Continuum Dynamics, Inc.

(609) 538-0444 (609) 538-0464 fax

34 Lexington Avenue Ewing, NJ 08618-2302

## AFFIDAVIT

Re: C.D.I. Technical Memo No. 11-24P "Nine Mile Point Velocity Squared Data Analysis" Revision 2

I, Alan J. Bilanin, being duly sworn, depose and state as follows:

1. I hold the position of President and Senior Associate of Continuum Dynamics, Inc. (hereinafter referred to as C.D.I.), and I am authorized to make the request for withholding from Public Record the Information contained in the document described in Paragraph 2. This Affidavit is submitted to the Nuclear Regulatory Commission (NRC) pursuant to 10 CFR 2.390(a)(4) based on the fact that the attached information consists of trade secret(s) of C.D.I. and that the NRC will receive the information from C.D.I. under privilege and in confidence.
2. The Information sought to be withheld, as transmitted to Constellation Energy Group as attachment to C.D.I. Letter No. 11130 dated 26 October 2011, C.D.I. Technical Memo No. 11-24P "Nine Mile Point Velocity Squared Data Analysis" Revision 2.
3. The Information summarizes:
  - (a) a process or method, including supporting data and analysis, where prevention of its use by C.D.I.'s competitors without license from C.D.I. constitutes a competitive advantage over other companies;
  - (b) Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;
  - (c) Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

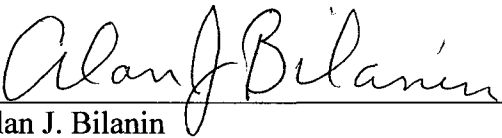
The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 3(a), 3(b) and 3(c) above.

4. The Information has been held in confidence by C.D.I., its owner. The Information has consistently been held in confidence by C.D.I. and no public disclosure has been made and it is not available to the public. All disclosures to third parties, which have been limited, have been made pursuant to the terms and conditions contained in C.D.I.'s Nondisclosure Secrecy Agreement which must be fully executed prior to disclosure.
5. The Information is a type customarily held in confidence by C.D.I. and there is a rational basis therefore. The Information is a type, which C.D.I. considers trade secret and is held in

confidence by C.D.I. because it constitutes a source of competitive advantage in the competition and performance of such work in the industry. Public disclosure of the Information is likely to cause substantial harm to C.D.I.'s competitive position and foreclose or reduce the availability of profit-making opportunities.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to be the best of my knowledge, information and belief.

Executed on this 26 day of OCTOBER 2011.

  
Alan J. Bilanin  
Continuum Dynamics, Inc.

Subscribed and sworn before me this day: 26 October 2011

  
Eileen P. Burmeister, Notary Public

EILEEN P. BURMEISTER  
NOTARY PUBLIC OF NEW JERSEY  
MY COMM. EXPIRES MAY 6, 2012