UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 10, 2010

Mr. Samuel L. Belcher
Vice President Nine Mile Point
Nine Mile Point Nuclear Station, LLC
P.O. Box 63
Lycoming, NY 13093

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING NINE MILE POINT NUCLEAR STATION, UNIT NO. 2 – RE: THE STEAM DRYER REVIEW OF THE LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE OPERATION (TAC NO. ME1476)

Dear Mr. Belcher:

By letter dated May 27, 2009, as supplemented on August 28 and December 23, 2009, and February 19, 2010, Nine Mile Point Nuclear Station, LLC, submitted for Nuclear Regulatory Commission (NRC) staff 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 No. 2 extended power uprate operation.

The NRC staff is reviewing the information provided in that letter and has determined that additional information is needed to support its review. Enclosed is the NRC staff's request for additional information (RAI). The RAI was discussed with your staff on February 26, 2010, and it was agreed that your response would be provided within 60 days from the date of this letter.

Pursuant to 10 CFR 2.390, we have determined that the enclosed RAI contains proprietary information. We have prepared a non-proprietary version of the RAI (Enclosure 1) that does not contain proprietary information. The proprietary information is indicated in brackets and underlined in Enclosure 2.

Sincerely,

Richard V. Guzman, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-410

Enclosures:
As stated

cc w/o Enclosure 2: Distribution via Listserv

REQUEST FOR ADDITIONAL INFORMATION (RAI)

NINE MILE POINT NUCLEAR STATION, UNIT NO. 2 (NMP2)

RE: STEAM DRYER REVIEW OF LICENSE AMENDMENT REQUEST (LAR)

FOR EXTENDED POWER UPRATE

DOCKET NO. 50-410

The Nuclear Regulatory Commission (NRC) staff is reviewing the Nine Mile Point Nuclear Station (NMPNS) license amendment request (LAR) application dated May 27, 2009, as supplemented on August 28 and December 23, 2009, and February 19, 2010. The NRC staff has determined that additional information regarding the NMP2 steam dryer (SD) as requested below will be needed to support its review.

NMP2-EMCB-SD-RAI-6

This pertains to the [[ ]] signals from the current licensed thermal power (CLTP) signals, [[ ]] the hydrodynamic and acoustic loads on the steam dryer. In a recent conference call with NMPNS on October 30, 2009, regarding the use of Revision 4 of the Continuum Dynamics Incorporated (CDI) Acoustic Circuit Model (ACM), with respect to the extended power uprate (EPU) application, the NRC staff was informed that during the benchmarking of the ACM parameters, by means of the Quad Cities Unit 2 (QC2) data, the [[ ]] from the main steam line (MSL) strain gage signals used to estimate the steam dryer loads. Therefore, it is [[ ]] from the NMP2 strain gage data prior to computing dryer loads using Rev. 4 of the ACM.

The licensee is requested to provide revised dryer stress analysis results for EPU conditions based on dryer loads [[ ]]. In addition, the licensee is requested to ensure that the minimum alternating stress ratio (SR-a) is not less than 2.0 for any dryer component for the projected EPU conditions.

NMP2-EMCB-SD-RAI-7

The licensee is requested to provide a detailed description (i.e., a step-by-step procedure) of how the QC2 MSL strain gage signals at CLTP were modified (both during and after data acquisition) before they were applied to the ACM Rev. 4 Code (whose results were used for benchmarking) to estimate acoustic loads on the instrumented QC2 dryer. Please also provide a step-by-step comparison of this benchmarking procedure with the procedures used in revising the MSL strain gage signals at CLTP for NMP2. Additionally, the licensee is requested to provide the following information about any exclusion frequencies:

a) Provide the amplitudes of the QC2 MSL strain gage signals for the exclusion frequencies (60, 120, and 180 Hz) at CLTP conditions before these frequencies were removed or filtered. Discuss which of these frequencies were treated as exclusion frequencies in modifying the QC2 signals.

b) Provide the information on the QC2 recirculating pump frequency, and provide the amplitudes of the MSL strain gage signals at this frequency. Explain whether this frequency was treated as an exclusion frequency in modifying the QC2 signals.

c) Explain whether any exclusion frequency filtering was also applied to the instrumented QC2 dryer pressure signals.

d) Provide a comparison of frequencies that were treated as exclusion frequencies in the ACM Rev. 4 benchmarking and NMP2 stress analysis. Please also provide an explanation of the differences.

NMP2-EMCB-SD-RAI-8

This RAI pertains to the [[ ]] signals from the MSL strain gage signals at CLTP, [[ ]] the hydrodynamic and acoustic loads on the steam dryer. In a recent conference call with NMPNS on 4 February 2010, on using Revision 4 of the Continuum Dynamics Incorporated (CDI) Acoustic Circuit Model (ACM), regarding their Extended Power Uprate (EPU) application, the NRC staff was informed that during the benchmarking of the ACM parameters, by means of the Quad Cities Unit 2 (QC2) data, [[ ]] the data used to estimate the steam dryer loads. Therefore, it is [[ ]] to the NMP2 strain gage data prior to computing dryer loads using Rev. 4 of the ACM.

The licensee is requested to provide revised dryer stress analysis results for EPU conditions based on dryer loads [[ ]]. In addition, the licensee is requested to ensure that the minimum alternating stress ratio (SR-a) is not less than 2.0 for any dryer component for the projected EPU conditions.

NMP2-EMCB-SD-RAI-9

Contrary to the staff's understanding of the methodology employed in ACM Rev. 4 benchmarking, based on the QC2 data, various boiling-water reactor plants are using an approach that would result in [[

]].

NMP2-EMCB-SD-RAI-10

Table 2.1 of CDI Report No. 08-08P, Rev. 3: "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Nine Mile Point Unit 2 Steam Dryer to 250 Hz," dated December 2009, contains the locations of the strain gage arrays on the four main steam lines as listed below:

[[

]]

[[

]]

a. [[

]]

b. [[

]]

c. [[

]]

d. [[

]]

NMP2-EMCB-SD-RAI-11

Large peaks in the steam dryer loading at frequencies [[ ]] were reported in Rev. 1 of CDI Report 08-08P," Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Nine Mile Point Unit 2 Steam Dryer to 250 Hz" (see Figure 4.6). Those

peaks have disappeared in Revisions 2 and 3 of the CDI Report 08-08P. Explain the cause of these peaks in Rev. 1 of the report, and the reason(s) why they no longer exist in Rev. 3 of the report.

NMP2-EMCB-SD-RAI-12

In Table 3.2 of CDI Report No. 08-08P, Rev. 3: "Acoustic and Low Frequency Hydrodynamic Loads at CLTP Power Level on Nine Mile Point Unit 2 Steam Dryer to 250 Hz", dated December 2009, several frequency peaks are attributed to pipe vibrations and are therefore filtered from the strain gage signals before calculating the dryer dynamic loading. Therefore, the applicant is requested to:

a. [[ ]]

b. [[ ]]

c. [[ ]]

d. [[ ]]

e. [[ ]]

f. [[ ]]

NMP2-EMCB-SD-RAI-13

SIA Calculation No. NMP-26Q-302 states that 14 of the 64 MSL strain gages used to measure the CLTP data in the NMP2 plant failed during the April 2008 test. The licensee is requested to explain whether Constellation Energy Group (CEG) plans to repair those strain gages prior to power ascension. The licensee is also requested to address the minimum number of strain gages required, and their circumferential locations, for estimating the acoustic pressure loads on the steam dryer during power ascension.

NMP2-EMCB-SD-RAI-14

SIA Calculation No. NMP-26Q-302 indicates that [[ ]] were recorded for all strain gages. CEG is requested to clarify whether or not the [[ ]] were filtered out from the strain gage data provided in Figures 1 to 10, and the subsequent spectra and waterfall plots of the same calculation.

NMP2-EMCB-SD-RAI-15

The Scale Model Tests (SMTs) of the main steam piping are described in CDI Report No. 08-13P, Rev 1: "Flow-Induced Vibration in the Main Steam Lines at Nine Mile Point Unit 2 and Resulting Steam Dryer Loads." [[

]]

NMP2-EMCB-SD-RAI-16

The scale model tests are described in CDI Report No. 08-13P, Rev 1: "Flow-Induced Vibration in the Main Steam Lines at Nine Mile Point Unit 2 and Resulting Steam Dryer Loads." On page 24 of the report, it is stated that the standpipes in the scale model were made, [[

]] The licensee is requested to provide a comparison between the standpipe geometries in the scale model and the full size plant, and explain the effect of [[ ]] on the SMT results, including the bump-up factor.

NMP2-EMCB-SD-RAI-17

Figure 9.1 of CDI Report No. 08-13P, Rev 1, "Flow-Induced Vibration in the Main Steam Lines at Nine Mile Point Unit 2 and Resulting Steam Dryer Loads," provides the bump-up factor which should be used to estimate the EPU loading from the measured CLTP loading. Since this figure shows large variations in the bump-up factor (from 0.8 to 2.5), the mean value is not readily apparent. The licensee is requested to include with the figure the mean values of the bump-up factor as a function of frequency. For frequencies with the bump-up factor not larger than the square of the velocity ratio, the licensee is requested to ensure that the steam dryer stress analysis utilizes a minimum bump up factor based on velocity square ratio. For frequencies with

the bump-up factor larger than the square of the velocity ratio, the licensee is requested to ensure that the steam dryer stress analysis utilizes the corresponding bump-up factors.

NMP2-EMCB-SD-RAI-18

In Section 4.4 of the CDI Report 09-26P, "Stress Assessment of Nine Mile Point Unit 2 Steam Dryer at CLTP and EPU Conditions," the fatigue stresses at a limited number of fillet welds are calculated by estimating the nominal stress at the weld and multiplying it by a factor of 4 in accordance with the American Society of Mechanical Engineers, *Boiler and Pressure Vessel Code* (ASME Code), Section III, Table NG-3352-1. The staff finds this approach acceptable; however, the procedure used in estimating the nominal stress does not follow the intention of the ASME Code. The Code intention is to use the nominal stress at the weld and not at an element away from the weld. Therefore, the licensee is requested to use the nominal stress at the weld for estimating the fatigue stresses at the fillet weld.

NMP2-EMCB-SD-RAI-19

The licensee is requested to provide the size and locations of any undersized fillet welds in the NMP2 steam dryer, and explain how the fatigue stresses are calculated at those welds.

NMP2-EMCB-SD-RAI-20

Appendix A of the CDI report 09-26P, "Stress Assessment of Nine Mile Point Unit 2 Steam Dryer at CLTP and EPU Conditions," discusses submodeling and the closure plate modification, which includes the addition of stiffening ribs on the plate, so that the alternate stress ratio will be greater than 2.0. The staff requests details on how the modified closure plate is incorporated in the finite element model of the steam dryer. The licensee has incorporated the increased fundamental frequency (256 Hz) of the modified plate by increasing the thickness of the original unmodified plate. The fundamental mode shape of the modified closure plate would be different than that of the unmodified plate, and is not accounted for in the finite element model that is used to calculate the stresses in the steam dryer. As discussed in Appendix A (p. 95), the shape of the fundamental mode would determine the locations of the significant stresses. Therefore, the licensee is requested to include both the fundamental frequency and mode shape of the modified closure plate in the finite element model, perform the stress analysis using this model, and then provide the resulting stresses.

NMP2-EMCB-SD-RAI-21

For submodeling analysis of the modified closure plate, the applicant cuts the global model by an intersection box (typically a 6" cube) and obtains the resulting intersection lines as discussed in Appendix A of the CDI Report 09-26P. The licensee is requested to confirm whether the intersection lines are located at an adequate distance away from the weld, so that the mesh

refinement at the weld produces local changes to stress and strain, while stresses and displacement on the intersection lines remain unchanged.

NMP2-EMCB-SD-RAI-22

The licensee is requested to provide a detailed description of the 'overlay welds' that will be used to repair the cracks in the tie bar of the NMP2 dryer due to intergranular stress-corrosion cracking (IGSCC). The licensee is requested to explain how any changes in stiffness caused by the overlay welds have been included in the NMP2 dryer finite element (FE) stress model.

NMP2-EMCB-SD-RAI-23

In Section 4.2 of the SIA report on flaw evaluation (Report No. 0801273.401, Rev. 1), the applicant presents the fatigue crack growth of the 1.08-in. long flaw present in the NMP2 drain channel. It assumes an R-ratio (stress intensity factor ratio K_{min}/K_{max}) of 1 to account for the high mean stress, refers to Reference Fatigue Crack Growth Curves from the ASME Code, Section XI (Figure 4.1), and concludes that the expected fatigue crack growth is minimal. The staff requests the following additional information in order to confirm this conclusion.

Figure 4.1 provides reference crack growth curves for R=0.0, 0.79 and 0.9. Provide the extrapolated crack growth curve for R=1.0 and a temperature of 550 °F. Please estimate the crack growth rate for the range of stress intensity factor ΔK_I=2.75 ksi-in$^{0.5}$, which is the bounding range of K_I for the flaws in the drain channel, for R=1.0 and a temperature of 550 °F. In addition, please estimate the projected crack growth during one fuel cycle.

NMP2-EMCB-SD-RAI-24

The licensee is requested to explain the cause(s) of the fatigue cracks in the drain channel to skirt vertical welds. If these cracks are associated with the steam dryer acoustic loading, it is requested that the licensee explain why the estimated steam dryer alternating stresses are significantly less than 13,600 psi. If these cracks are not associated with the steam dryer acoustic loading, the licensee is requested to explain how the mechanism(s) responsible will be accounted for EPU conditions.

March 10, 2010

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