



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

May 13, 2013

**LICENSEE:** Nine Mile Point Nuclear Station

**FACILITY:** Nine Mile Point Nuclear Station, Unit 2

**SUBJECT:** SUMMARY OF MARCH 29, 2013, MEETING WITH NINE MILE POINT NUCLEAR STATION, UNIT 2, TO DISCUSS USE OF GESTR-M VERSUS PRIME CODE IN THE PLANNED AMENDMENT REQUEST ON IMPLEMENTATION OF MELLLA+ (TAC NO. MF0587)

On March 29, 2013, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of Nine Mile Point Nuclear Station, Unit 2 (NMP2) at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland (see notice at Agencywide Documents Access and Management System Accession No. ML13077A047). The purpose of the meeting was to discuss the licensee's plan to use GESTR-M Code versus PRIME Code in the planned license amendment request (LAR) for the Maximum Extended Load Line Limit Analysis Plus (MELLLA+) at NMP2. A list of attendees is provided as Enclosure 1.

The licensee provided, in detail, its position and arguments regarding its intention to take exception to Condition/ Limitation 9.12 of the Safety Evaluation for Topical Report NEDC-33173(P) (A), "Applicability of General Electric Methods to Expanded Operating Domain," July 21, 2009. The licensee also discussed the use the GESTR-M code instead of the PRIME code in its planned submission of the LAR to implement MELLLA+. The NRC staff asked questions about its approach. The licensee's presentation is provided in Enclosure 2.

The licensee's presentation (see Enclosure 2) to justify its exception to Condition/ Limitation 9.12 and explanation of its approach in the LAR technical justifications consisted of a detailed discussion of various aspects, including the following:

- (1) consistency of the licensee's approach with Supplement 4(A) of NEDO-33173, in the LAR for addressing Thermal Conductivity Degradation, Thermal-Mechanical (T-M) Basis,
- (2) penalty of 350 psi for Critical Pressure applied for T-M Operating Limits for the Fuel,
- (3) consistency of the licensee's approach with the Extended Power Uprate Safety Evaluation Report,
- (4) original plan of implementation of MELLLA+ was to submit the LAR immediately after EPU, how the majority of the Analyses were completed prior to completion of the NRC Audit of the PRIME code implementation in October 2012, and how it would pose a hardship to the licensee to perform all the analyses in PRIME Code,
- (5) Additional activities needed to be completed after Approval of PRIME code in January 2010,

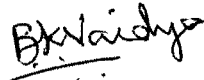
- (6) findings of studies to assess the impact of PRIME on fuel thermal-mechanical analyses, Safety Limit Minimum Critical Power Ratio, transient analyses, Anticipate Operational Occurrences, and Anticipated Transient Without SCRAM
- (7) other cycle specific Reload Analyses and associated safety analyses using PRIME Code to be submitted as a supplement to LAR, including the relationship of Results of ATWS-I and TRACG04 with PRIME Analysis, and Supplemental Reload Licensing Report, which will be available at least 2 months prior to the refueling outage in spring 2014, and
- (8) the safety and other benefits of transitioning to MELLLA+.

The NRC staff asked clarifying questions throughout the presentation.

In its feedback to the licensee, the NRC staff expressed its appreciation for this opportunity to get a preview of the basis, reasoning, and justifications, including the benefits of implementing MELLLA+, which might be presented in the LAR. The NRC staff pointed out that its review of the LAR, including the acceptance review of the LAR, will include careful considerations of the Conditions and Limitation that are specified in its approval of the Topical Report NEDC-33173P-A, as well as the implications of deviating from those. Also, the NRC staff may have to perform its own independent studies/analyses, which would involve significant time and effort.

Members of the public were in attendance. Public Meeting Feedback forms were not received.

Please direct any inquiries to me at 301-415-3308, or [Bhalchandra.Vaidya@nrc.gov](mailto:Bhalchandra.Vaidya@nrc.gov).



Bhalchandra Vaidya, Project Manager  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-410

Enclosures:

- 1. List of Attendees
- 2. Licensee Handouts

cc w/encls: Distribution via Listserv

PUBLIC MEETING WITH NINE MILE POINT NUCLEAR STATION, UNIT 2,

PRE-APPLICATION MEETING ON

MAXIMUM EXTENDED LOAD LINE LIMIT ANALYSIS PLUS

PROPOSED LICENSE AMENDMENT

MARCH 29, 2013

LIST OF ATTENDEES

U.S. Nuclear Regulatory Commission

B. Vaidya  
T. Huang  
D. Woodyatt  
C. Jackson  
H. Scott

N. Karipineni  
A. Guzzetta  
A. Proffitt  
S. Meighan  
S. Whaley

GE Hitachi Nuclear Energy

L. Schichlein(\*)  
G. Carlisle  
J. Vedovi(\*)  
R. Jacobs(\*)  
B. Berg(\*)  
C. Robert(\*)

J. Harrison(\*)  
P. Diller(\*)  
P. Sharpe(\*)  
T. Stoddard(\*)  
N. Parham((\*)

Constellation Energy Nuclear Group (CENG) Nine Mile Point

D. Goodney  
T. Darling  
J. Shobert  
P. Swift

G. Inch  
R. Close  
S. Day(\*)  
E. P. Chip Perkins

Public

D. Neff, Exelon

(\*)\* Via telephone

ENCLOSURE 2

# CENG

a joint venture of



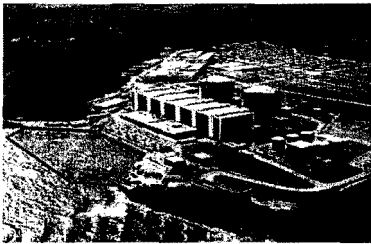
**Constellation  
Energy**



**edf**



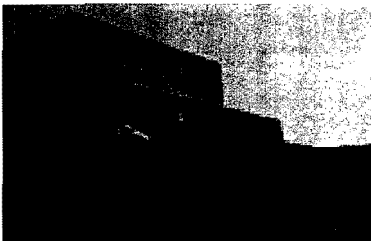
## Nine Mile Point Unit 2 (NMP2)



Maximum Extended Load Line Limit Analysis Plus  
(MELLLA+)



Thermal-Mechanical Basis - GESTR-M vs PRIME



# Overview

---

- NMP2 MELLLA+ License Amendment Request (LAR) – Thermal-Mechanical (T-M) Basis
- Thermal Conductivity Degradation
- MELLLA+ LAR Analyses for NMP2
- Impact of PRIME on MELLLA+ Analyses
- MELLLA+ PRIME Implementation
- NMP2 MELLLA+ LAR Safety Benefits
- Summary of Proposed NMP2 MELLLA+ LAR



# NMP2 MELLLA+ LAR Thermal-Mechanical Basis

---

- NMP2 MELLLA+ LAR will take exception to Limitation and Condition 9.12 of NEDC-33173P-A to utilize PRIME T-M methods following NRC Approval.
  - NMP2 MELLLA+ analysis for GE14 fuel performed using GESTR-M is consistent with NMP2 Extended Power Uprate (EPU) SER issued December 2011.
  - Original plan was to submit MELLLA+ LAR immediately following EPU approval and implement MELLLA+ mid cycle 14 (2013). In support of this date, MELLLA+ LOCA analysis and other GESTR-M based analyses were performed prior to completion of PRIME implementation activities.
  - While the PRIME T-M method was approved by the NRC in January 2010, the activities necessary for implementation were not complete until the NRC issued their audit report on October 22, 2012.
  - NMP2 MELLLA+ LAR T-M basis utilizes the methodology to address thermal conductivity degradation approved by the NRC in NEDO-33173, Supplement 4.
  - In the MELLLA+ analysis the fuel T-M Operating limit has incorporated the NEDC-33173P SER Appendix F Penalty of 350 psi on Critical Pressure.



# Thermal Conductivity Degradation and PRIME

---

- PRIME addresses degradation of fuel thermal conductivity as fuel exposure increases over time
  - Thermal conductivity degradation for ECCS LOCA response manifests at exposures well beyond the exposures associated with limiting Peak Cladding Temperatures (PCTs) for BWRs.
- Adjusted thermal mechanical properties in PRIME predominantly affect the stored energy in the fuel at event initiation
  - Improved modeling characteristics rather than thermal conductivity degradation lead to the stored energy calculated by PRIME being greater than that calculated by GESTR-M.
  - For Small Break LOCAs, there is no increase in PCT. The increased stored energy associated with the PRIME model is readily absorbed by the large coolant inventory remaining during the initial stages of the event that allows continued heat transfer by nucleate boiling.
  - For Large Break LOCAs, there is a small increase in PCT. It is not limiting and therefore may be considered insignificant (<50°F).





# MELLLA+ LAR Analyses for NMP2

---

- Cycle Independent Analyses
  - LOCA
  - Anticipated Transient Without Scram (ATWS)
- Cycle Specific Reload Analyses
  - Safety Limit Minimum Critical Power Ratio (SLMCPR)
  - Transient Analysis (Anticipated Operational Occurrences-AOO)
  - Stability
  - MELLLA+ cycle specific reload analysis will use PRIME



# Impact of PRIME on LOCA PCT for NMP2

---

- Impact of PRIME has been evaluated based on NEDO-33173 Supplement 4.  
Predicted PRIME impact:
  - Small Break LOCA PCT - 0°F
  - Large Break LOCA PCT - < 50°F
- NMP2 is Small Break LOCA limited with respect to PCT
  - Limiting conditions for Small Break LOCA are; 0.07 FT<sup>2</sup> break size, 6 ADS valves open, HPCS Diesel Generator single failure, top peak
    - Appendix K: 1529°F, Nominal: 1198°F
- Large Break Margin
  - Appendix K: 1322°F, Nominal 1001 °F
- NMP2 margin between small and large break LOCA is greater than 200°F.
- For the NMP2 MELLLA+ analysis, the predicted limiting licensing basis PCT is the same for both GESTR-M and PRIME methods.
- Thermal conductivity degradation and other improved modeling features of PRIME do not affect the outcome.
- Therefore, there is no safety impact utilizing GESTR-M in lieu of PRIME.



# Impact of PRIME on ATWS

---

- Anticipated Transient Without Scram (ATWS) – impact on licensing analysis parameters is insignificant:
  - ODYN/TASC03 sensitivity study for BWR/5 (NMP2 M+) in response to 2012 PRIME audit
    - Average PCT increase of 16°F, no more than 48°F
    - Neutron Flux decrease of 8%
    - Maximum Vessel Pressure – No change
    - Maximum Bulk Suppression Pool Temperature increase of 0.54°F
  - NMP2 MELLLA+ PCT is 1281°F (ATWS-I –TRACG04 w/ PRIME)



# Impact of PRIME on Cycle Specific Analyses

---

- The Safety Limit Minimum Critical Power Ratio (SLMCPR) impact is below Monte Carlo variability ( $\pm 0.005$ ).
- Transient Analysis (Anticipated Operational Occurrences-AOO) impact on transient delta-CPR and Operating Limit Minimum Critical Power Ratio (OLMCPR) predictions is insignificant for analyzed AOOs.
  - Changes to Mechanical Overpower (MOP) and Thermal Overpower (TOP) values, based on PRIME predictions, are conservative.
- Stability results are based on ODYSY and TRACG analyses:
  - Use of GESTR-M with ODYSY to determine Backup Stability Protection (BSP) regions generates same or more conservative Decay Ratios than use of PRIME, therefore BSPs are conservative.
  - Sensitivity studies show no significant impact on TRACG stability analysis using PRIME.



# MELLLA+ PRIME Implementation

---

- NMP2 MELLLA+ LAR will include information that demonstrates how NMP2 has addressed the thermal conductivity degradation issue based on the generic assessment provided in PRIME RAI 39 which led to the approved transition plan in NEDO-33173, Supplement 4, as well as information developed during the implementation of PRIME into the downstream methods.
- NMP2 cycle - specific reload analyses will implement PRIME
  - Documented in Supplemental Reload Licensing Report (SRLR)
  - For LOCA, PRIME implementation executed via a 10 CFR 50.46 Notification Letter of an evaluation methodology change
  - Transient analyses and Stability analysis will be PRIME-based
  - Submittal required per the MELLLA+ Safety Evaluation Report



# NMP2 MELLLA+ LAR Safety Benefits

---

- The MELLLA+ operating domain:
  - Provides a larger core flow operating window
  - Reduces challenges to reactivity management
  - Simplifies core management
- Increasing boron-10 enrichment in the sodium pentaborate solution utilized in the Standby Liquid Control System (SLS) results in increased safety margin.
  - Only one SLS pump is required to mitigate an Anticipated Transient without SCRAM (ATWS).



# Summary

---

- Thermal conductivity degradation and other improved modeling features of PRIME will not affect the limiting PCT for NMP2.
- NMP2 MELLLA+ LAR will provide the technical basis for taking exception to Limitation and Condition 9.12 of NEDC-33173P-A to utilize PRIME T-M methods following NRC approval.
- NMP2 MELLLA+ LAR will specifically address impact of thermal conductivity degradation on Licensing Basis PCT through 10 CFR 50.46 change notification process defined and approved in NEDO-33173, Supplement 4.
- NMP2 Cycle 15 SRLR will utilize PRIME, and it will be submitted for NRC review as required by the MELLLA+ Safety Evaluation Report.



- (6) findings of studies to assess the impact of PRIME on fuel thermal-mechanical analyses, Safety Limit Minimum Critical Power Ratio, transient analyses, Anticipate Operational Occurrences, and Anticipated Transient Without SCRAM
- (7) other cycle specific Reload Analyses and associated safety analyses using PRIME Code to be submitted as a supplement to LAR, including the relationship of Results of ATWS-I and TRACG04 with PRIME Analysis, and Supplemental Reload Licensing Report, which will be available at least 2 months prior to the refueling outage in spring 2014, and
- (8) the safety and other benefits of transitioning to MELLLA+.

The NRC staff asked clarifying questions throughout the presentation.

In its feedback to the licensee, the NRC staff expressed its appreciation for this opportunity to get a preview of the basis, reasoning, and justifications, including the benefits of implementing MELLLA+, which might be presented in the LAR. The NRC staff pointed out that its review of the LAR, including the acceptance review of the LAR, will include careful considerations of the Conditions and Limitation that are specified in its approval of the Topical Report NEDC-33173P-A, as well as the implications of deviating from those. Also, the NRC staff may have to perform its own independent studies/analyses, which would involve significant time and effort.

Members of the public were in attendance. Public Meeting Feedback forms were not received.

Please direct any inquiries to me at 301-415-3308, or [Bhalchandra.Vaidya@nrc.gov](mailto:Bhalchandra.Vaidya@nrc.gov).

/ra/

Bhalchandra Vaidya, Project Manager  
Plant Licensing Branch I-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-410

Enclosures:

1. List of Attendees
2. Licensee Handouts

cc w/ends: Distribution via Listserv

DISTRIBUTION:

PUBLIC	LPL1-1 R/F	RidsAcrcAcnw_MailCTR	RidsNrrDorl
RidsNrrDorlLpl1-1	RidsNrrDssScvb	RidsNrrDssSnpb	RidsNrrDssSrxb
RidsOpaMail	RidsRgn1MailCenter	AGuzzetta, NRR	THuang, NRR
DWoodyatt, NRR	TWertz, NRR	JCassidy, EDO Region I	RidsNrrPMNineMilePoint
RidsNrrLAKGoldstein			

**ADAMS Accession Nos.**

**PKG ML13092A418**

**Meeting Summary ML13092A008**

**Meeting Notice ML13077A047**

OFFICE	LPL1-1/PM	LPL1-1/LA	NRR/DSS/SRXB/BC	NRR/DSS/SNPB/BC	LPL1-1/BC(A)	LPL1-1/PM
NAME	BVaidya	KGGoldstein	CJackson	SWhaley	SMeighan	BVaidya
DATE	5/13/13	4/8/13	5/13/13	4/11 /13	5/13/13	5/13/13

OFFICIAL RECORD COPY