NRC FORM 658 (9-1999)

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

U.S. NUCLEAR REGULATORY COMMISSION

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DATE OF MEETING
01/22/2003

The attached document(s), which was/were handed out in this meeting, is/are to be placed in the public domain as soon as possible. The minutes of the meeting will be issued in the near future. Following are administrative details regarding this meeting:

Docket Number(s)	**50-325 AND 50-324**
Plant/Facility Name	**BRUNSWICK, UNITS 1 AND 2**
TAC Number(s) (if available)	**MB6692 AND MB6693**
Reference Meeting Notice	**JANUARY 7, 2003 (ML030070625)**
Purpose of Meeting (copy from meeting notice)	**TO DISCUSS 11/12/02 AMENDMENT REQUEST FOR CORE OPERATING RANGE EXTENSION KNOWN AS MELLLA+**

NAME OF PERSON WHO ISSUED MEETING NOTICE	TITLE
L. N. OLSHAN	**PROJECT MANAGER**

OFFICE
NRR

DIVISION
DLPM

BRANCH
PD II-1

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DF01

Brunswick Nuclear Plant
MELLLA+ Overview

January 22, 2003

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Agenda

- Bob Kitchen – EPU Project Manger
  - Introductions
  - Current EPU Status
  - Licensing Requirements
  - MELLLA+ Overview
- Mark Grantham – Superintendent EPU Design
  - Plant Impacts of MELLLA+
- Tom Dresser – Lead Engineer Fuels
  - Core Design and Timeline Requirements
- Mark Turkal – Lead Engineer Licensing
  - Interface/RAI Logistics
- Questions/Discussion

MELLLA+ Overview
Brunswick EPU – Plant Status

- Unit 1 – 94.3% (2755 MWt)
  - EPU Implemented June 1, 2002
  - Implementation Testing Completed Satisfactorily
  - Full Uprate in March 2004
- Unit 2 – 100% (2558 MWt – Pre-EPU RTP)
  - EPU Implementation in March 2003
  - Expect to Achieve 2800 MWt
  - Full Uprate in March 2005

MELLLA+ Overview
Licensing Submittal Status

Topic	Submittal Date	Needed Approval Date	Impact
THI Option III (Units 1 & 2)	June 26, 2001	Complete	Unit 1 Startup
Alternative Source Term (Units 1 & 2)	August 1, 2001	Complete	Unit 1 Initial Uprate
Power Uprate (Units 1 & 2)	August 9, 2001	Complete	Unit 1 Initial Uprate
Safety Limit MCPR (Unit 1)	September 18, 2001	Complete	Unit 1 Startup
AST License Condition (Unit 2)	September 16, 2002	Complete	Unit 2 Startup
SLC (Units 1 & 2)	July 24, 2002	February 2003	Unit 2 Startup
Safety Limit MCPR (Unit 2)	November 7, 2002	February 2003	Unit 2 Startup
MELLLA+ (Units 1 & 2)	November 12, 2002	October 2003	Unit 1 Core Design Flow Window Expansion

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MELLLA+ Overview

- MELLLA+ Is an Extension of the Existing Power Flow Map
- At Full Uprate Conditions, the Existing Flow Window Is Very Restrictive
  - 3.0% Unit 2
  - 5.5% Unit 1
- MELLLA+ Provides Flow Window for Sustained Operation at 120% OLTP

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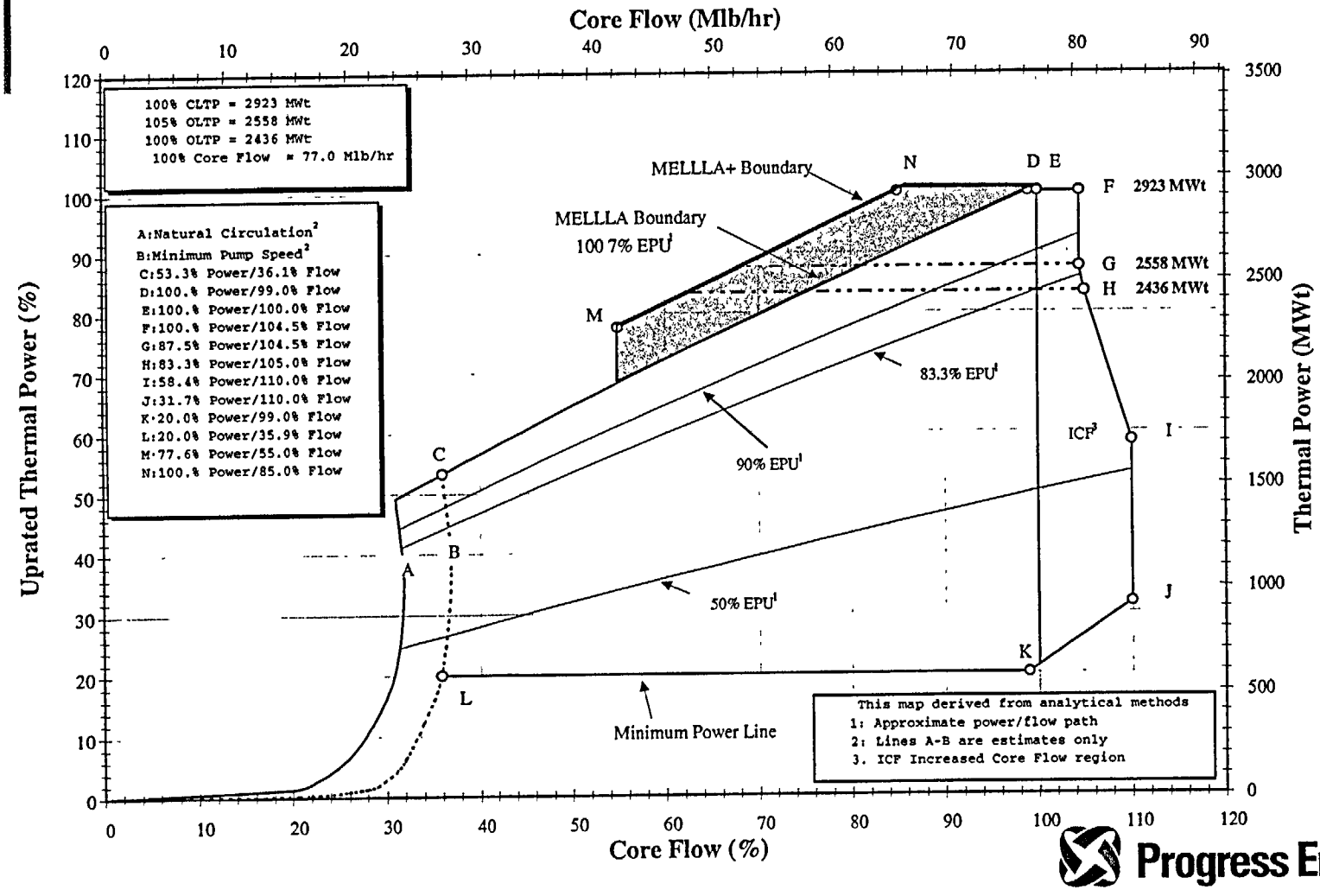
MELLLA+ Overview
Expanded Power Flow Map



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MELLLA+ Overview

Advantages of MELLLA+/Confirmation Density

- Operational Flexibility
- Fewer Required Reactivity Maneuvers
- Resolution of Option III (THI) Issues

MELLLA+ Overview
Licensing Requirements

- MELLLA+ Licensing Topical Report (NEDC-33006P)
  - In NRC Review
- Detect & Suppress Solution – Confirmation Density LTR (NEDC-33075P)
  - In NRC Review
- Upper Bound Peak Clad Temperature (NEDE-23785P-A)
  - NRC Approved
- BNP Amendment Request
  - In NRC Review

Plant Impacts of MELLLA+

Mark Grantham – Superintendent EPU Design

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MELLLA+ Overview
Areas of Minimal Impact

- MELLLA+ Effect on Balance of Plant
  - Moisture Carryover
- Single Feedwater Pump Trip Transient Margin
  - Margin Restored with FW Pump Modification
- Minimal Hardware Modifications
  - EPROM/Card Change
    - New Oscillation Power Range Monitor (OPRM) Algorithm

MELLLA+ Overview

Significant Impacts

- Moisture Carryover
- Equipment Out of Service
- ATWS Analysis
- LOCA Analysis
- Thermal-hydraulic Stability

MELLLA+ Overview
Moisture Carryover

- Original Design – 0.1% Moisture
- MELLLA+ Analysis – 0.14% Moisture
  - Conservatively Assumes High Water Level, High Radial Peaking Factors, AND Worst Case Power/flow
- Technical Evaluation – 0.2% Moisture
- No Equipment Impact
- Potential Impact
  - Higher Loading of Condensate Polishing Versus RWCU
  - Higher BOP Shutdown Doses

MELLLA+ Overview
Equipment Out of Service

- FW Heater Out of Service
  - Not Allowed in MELLLA+ Region
- Single Loop Operation and Main Steamline Valve Out of Service
  - Not Allowed in MELLLA+ Region
- Safety/Relief Valve Out of Service
  - Not Allowed in MELLLA+ Region
    - Required to Meet ATWS Overpressure Limits
    - 10% Setpoint Tolerance on One SRV Evaluated

MELLLA+ Overview
ATWS Analysis

- All SRVs Required to Meet ATWS
- Results

ATWS Acceptance Criteria	CLTP Result	MELLLA+ Result	Limit
Peak Vessel Bottom Pressure (psig)	1487	1457	1500
Peak Suppression Pool Temp (°F)	195.5	197.7	207.7
Peak Containment Pressure (psig)	12.9	13.5	62

Core Design and Timeline Requirments

Tom Dresser – Lead Engineer Fuels

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MELLLA+ Overview
LOCA Analysis

- Upper Bound PCT Limit
  - 1600°F SER Restriction Exceeded
  - GE Provides Unrestricted Licensing Basis
- Licensing Basis PCT Does Not Increase

MELLLA+ Overview
Thermal-Hydraulic Stability

- Stability Solutions Evolution
  - Unit 1 E1A Replaced With Option III for EPU
  - 10CFR21: Option III DIVOM Not Bounding
  - Option III Inadequate for MELLLA+
- Confirmation Density
  - MELLLA+ Stability Solution
  - LTR Submitted August 2002

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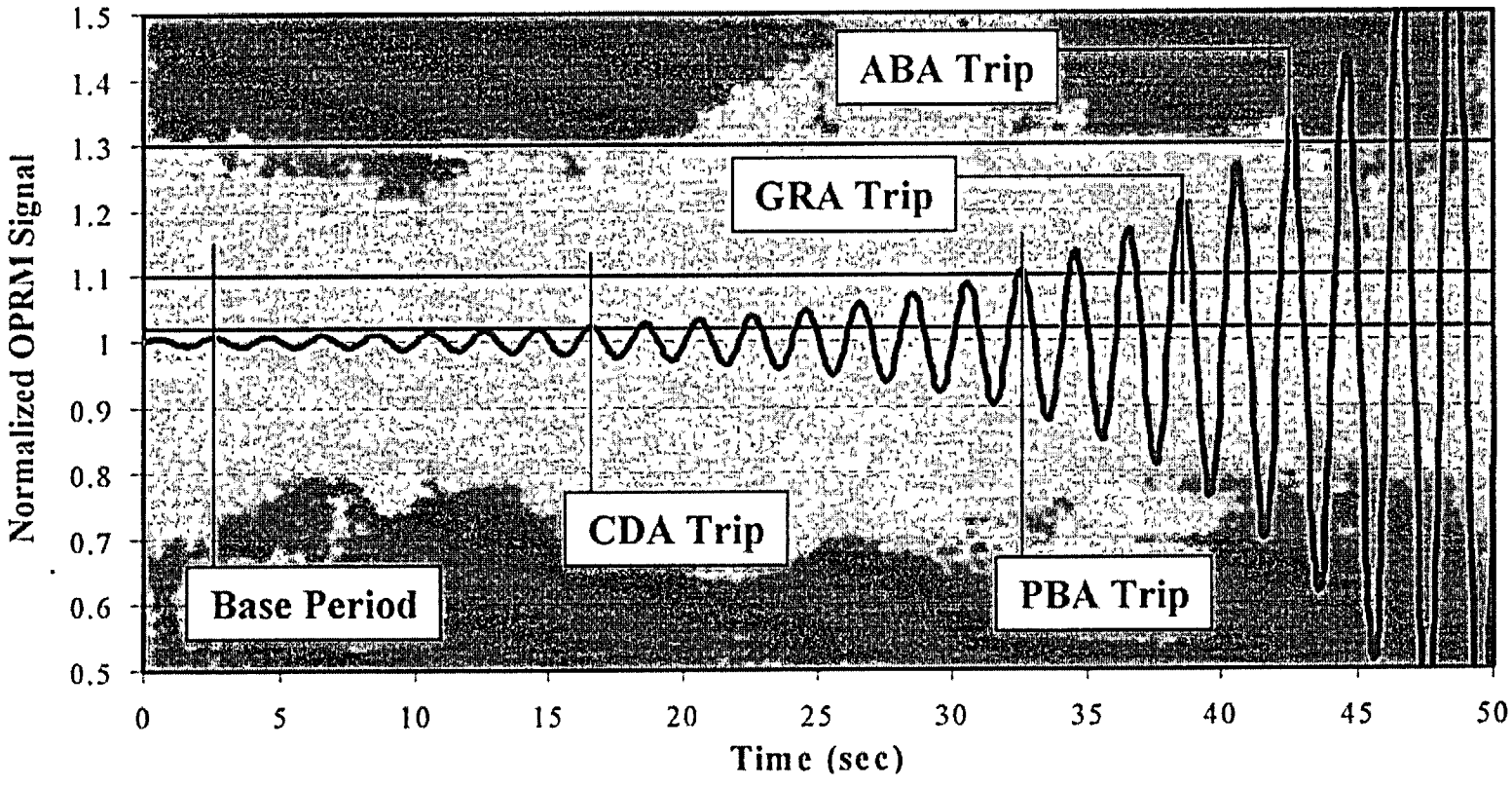
MELLLA+ Overview

Instability Detection – Comparison of Trips



Earlier Suppression = Increased MCPR Margin

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MELLLA+ Overview
Core Design Milestones

January 2003	• Energy Utilization Plan
March 2003	• Fuel Management Study
August 2003	• Fuel Loading Pattern
September 2003	• SLMCPR Submittal
October 2003	• Decision for Reload Analysis
	• NRC Approval of MELLLA+ Amendment
January 2004	• Complete Reload Analysis
March 2004	• BNP Unit 1 Refuel Outage

NRC-BNP Interface

Mark Turkal – Lead Engineer Licensing

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MELLLA+ Overview
Review Support

- RAI Responses < 3 Weeks
- Weekly Status Calls
  - Review RAI Status
  - Update Milestone Lists
  - Discuss Non-RAI Actions
- NRC Audits
- Advisory Committee on Reactor Safeguards

Questions/Discussion

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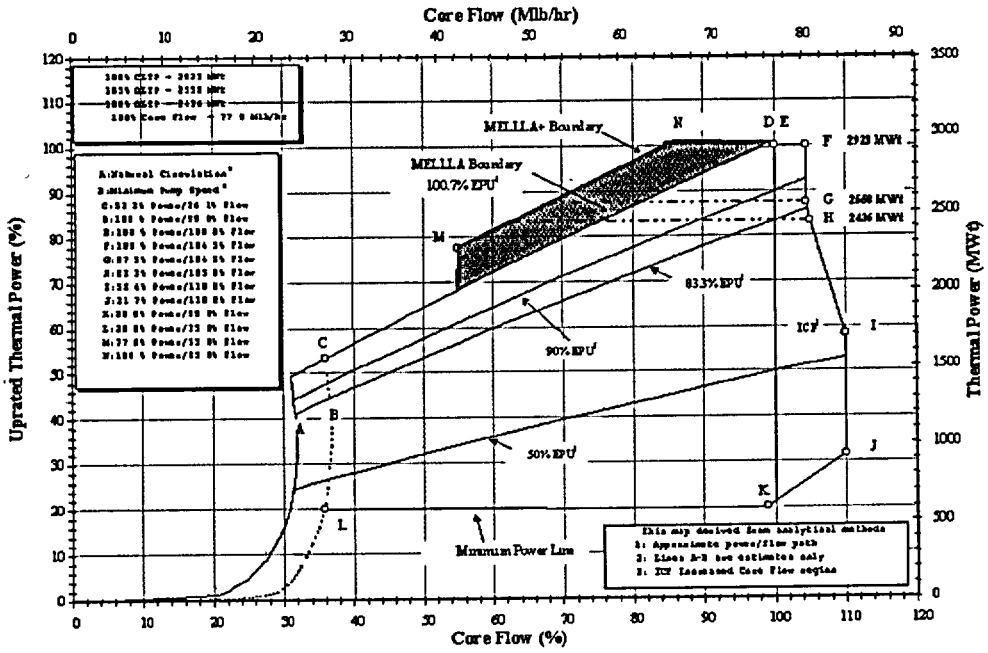
MELLLA+ General Information

What is MELLLA+?

MELLLA+ stands for Maximum Extended Load Line Limit Analysis Plus, and is an extension of the current power-flow map. The area highlighted in the power flow map below is the MELLLA+ region, which is being added to the power-flow map by this licensing action.



Why does BNP need MELLLA+?

BNP is currently licensed to 2923 MWt, or 120% of the original licensed thermal power. At 120% power, the currently licensed core flow window is from 99% to 104.5% (points D to F on the power-flow map above). Given the current Reactor Recirculation system, the maximum core flow that could be obtained on Unit 2 is approximately 102%. This only provides a 3% flow window (i.e. 99% to 102%) at full uprate conditions for Unit 2. Due to slightly larger core orificing, Unit 1 currently has a 5.5% flow window. These core flow windows are not adequate to maintain operation at 120% power for any significant length of time. In order to effectively deal with Xenon transients and normal power decay, a core flow band of at least 10% is needed. Based on the currently licensed power-flow map, this 10% core flow window would only support reliable operation at approximately 115% of original licensed thermal power. In order to effectively operate at the full 120% power allowed by EPU, an extension to the power-flow map is needed to provide a larger core flow range. The MELLLA+ license submittal will provide a core flow window of approximately 18%, which will support operation at the full EPU power.

What are the plant impacts from MELLLA+?

The impact of MELLLA+ is essentially limited to the NSSS side of the plant. The only BOP impact is a potential increase in moisture carryover in the steam leaving the vessel, which is discussed below. The impacts of MELLLA+ on plant design and operation are detailed below:

- MELLLA+ will allow operation at higher rod lines, which will affect plant response to an ATWS event. During an ATWS, the reactor power following the Recirculation Pump Trip will be approximately 10% higher under MELLLA+ than for the current licensed condition. As a result, BNP will not be allowed to have an SRV out-of-service while operating in the MELLLA+ region.

- In addition to the SRV out-of-service change, Single Loop Operation, MSIV Out-of-Service, FW Heater Out-of-Service, and Final Feedwater Temperature Reduction will not be allowed while operating in the MELLLA+ region. If plant/equipment issues dictate operation under any of these out-of-service conditions, the plant will have to exit the MELLLA+ region.

- The Recirculation System runback associated with a single Reactor feed water pump trip will result in a greater demand on the operating FW pump. This is due to operation at higher rod lines while in the MELLLA+ region. The new FW pumps, being installed as part of EPU, will support single FW pump operation at approximately 84% of uprated power, which is adequate for scram avoidance under the single FW pump trip scenario. This represents an actual improvement in FW pump margin over what is currently available today.

- LOCA analyses are normally performed at rated conditions (rated flow and power). For MELLLA+, a sensitivity review at the lower core flows was performed which identified that the Upper Bound Peak Clad Temperature (PCT) would be higher than the NRC SER acceptance limit of 1600 °F for the SAFER-GESTAR code. As a result, the MELLLA+ licensing submittal is taking advantage of a GE licensing topic report which eliminates the 1600 °F Upper Bound PCT limit. The GE topical for elimination of the 1600 °F limit has been approved by the NRC, and will provide significant future benefit (e.g. analysis error evaluations) to BNP.

- Operation in the MELLLA+ region results in greater subcooling at the core inlet which has a negative impact on thermal hydraulic stability. As a result, a new stability solution is required. A new stability solution has been developed by GE and is being licensed as part of the MELLLA+ submittal. This stability solution is Detect and Suppress Solution – Confirmation Density (DSS-CD). The DSS-CD solution uses the same hardware as the existing Option III solution, but will require an E-PROM/card change to support the new algorithm. The DSS-CD solution detects the inception of power oscillations and generates an early power suppression trip (scram), whereas, the existing Option III solution generates a suppression trip based on oscillations AND a specific oscillation amplitude.

- BNP was originally designed for a moisture carryover of up to 0.1%. The MELLLA+ analysis predicts that under the extreme conditions of high reactor water level (at alarm point), high radial peaking factor, AND the 85% rated core flow, the moisture carryover could approach 0.14%. An analysis was performed as part of MELLLA+ which demonstrates moisture values up to 0.2% are acceptable. The only impact of higher moisture carryover is the increased transport of fission products to the BOP side of the plant. This would result in a minor change in the percentage of fission products processed by RWCU and the Condensate filters/demineralizers (RWCU percentage goes down while Condensate goes up). Since operating dose rates in the BOP systems are dominated by N-16, there is not expected to be any increase in the normal operation dose levels as a result of MELLLA+. Shutdown doses could potentially be higher in some BOP systems. Due to the combination of extreme conditions required to achieve the highest predicted moisture carryover levels, the overall impact on the plant is expected to be minimal.

What modifications are required for MELLLA+?

There are no significant hardware modifications required for the implementation of MELLLA+. The only required change is an E-PROM/card change in the PRNM system to support the DSS-CD stability solution algorithm.