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January 13, 2014 10 CFR 52

U.S. Nuclear Regulatory Commission (NRC)
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852-2738

Subject: Project No. PROJ0776
Generation mPower LLC (GmP)
Submittal of mPower™ NSSS Update Slides (System Design Update, DRAP Update, ASME Code Update), and Gale Code Update Slides
Ltr. No. LTR-14-0120

Reference: Letter, Hastings to Document Control Desk, *Submittal of Design Approach for Diversity & Defense-in-Depth, DNB Methodology Topical Report, and Reactor Coolant Pump Flywheel Design and Technical Report Contents Slides*, LTR-13-0087, dated November 21, 2013 (ML13329A724)

A meeting is scheduled between GmP and NRC staff in Rockville, MD on January 28 and 29, 2014, to discuss the subject topics. Participants will include technical staff from GmP, B&W mPower, Bechtel Power Corporation, and the NRC staff. Additional topics to be discussed during the two days of meetings include Diversity and Defense-in-Depth, Reactor Coolant Pump Flywheel Report Overview, and Departure from Nucleate Boiling (DNB) Methodology Report Overview. The slides for those topics were previously submitted to the NRC under separate correspondence (see Reference).

Presentation slides for the subject meeting topics are enclosed. A portion of the information provided in the slides is Proprietary information. Therefore enclosed are two versions of the slides. Enclosure 1 is a signed affidavit that provides the justification for withholding the Proprietary information identified in Enclosures 2 and 3 that is marked in brackets. GmP requests that this bracketed information be withheld from public disclosure in accordance with the requirements of 10 CFR 2.390. Enclosures 4 and 5 are non-proprietary (redacted) versions of the slides for public release.

If you have any questions or need any additional information, please contact me at your convenience at (980) 365-2071 or at pshastings@generationmpower.com.

Peter S. Hastings
Director of Licensing
Generation mPower, LLC

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NRO

Enclosures:
1. Affidavit
2. mPower NSSS Update Slides (System Design Update, DRAP Update, ASME Code Update) (Proprietary)
3. Gale Code Update Slides (Proprietary)
4. mPower NSSS Update Slides (System Design Update, DRAP Update, ASME Code Update) (Redacted)
5. Gale Code Update Slides (Redacted)

cc: J. L. Starefos, NRC, TWFN 9-F-27
S. L. Magruder, Jr, NRC, TWFN 9-F-27

Enclosure 1
AFFIDAVIT of Peter S. Hastings

AFFIDAVIT OF PETER S. HASTINGS

State of Virginia

City of Lynchburg

I, Peter S. Hastings, being duly sworn, do hereby depose and say:

1. I am the Director of Licensing for Generation mPower LLC (GmP). I have been delegated the responsibility for reviewing information sought to be withheld from public disclosure in connection with information being submitted to U.S. Nuclear Regulatory Commission (NRC) related to the proposed mPower Plant design certification application and I am authorized to apply for its withholding from public disclosure on behalf of GmP.

2. I am making this affidavit in conformance with the provisions of 10 CFR 2.390 of the regulations of the NRC and in conjunction with GmP's application for withholding which accompanies this affidavit.

3. I have knowledge of the criteria used by GmP in designating information as sensitive, proprietary, or confidential. I am familiar with the information contained in presentation slides entitled "NSSS Update" and "Calculation of Coolant and Effluent Activities." Information contained in these documents has been classified by GmP as sensitive, proprietary, or confidential in accordance with GmP procedures.

4. Pursuant to the provision of paragraph (a)(4) of 10 CFR 2.390, the following is furnished for consideration by the NRC in determining whether the information sought to be withheld from public disclosure should be withheld:

a) The information sought to be withheld from public disclosure is owned by or licensed to GmP and has been held in confidence by GmP, Babcock & Wilcox mPower, Inc. (B&W mPower), and their consultants.

b) The information sought to be protected is not publicly available to the best of our knowledge and belief.

c) The information is of the type that would customarily be held in confidence by GmP. This information includes GmP's and B&W mPower's conceptual and technical approaches regarding details of the design of the B&W mPower™ reactor systems, structures, and components and associated analysis, and classifications, disclosure of which could adversely affect our competitive position by informing competitors of the degree of maturity and viability of the program, thereby motivating them to increase efforts to develop competing technologies. All or parts of the approach described in the withheld material is patentable.

d) Release of the subject information will harm GmP because GmP will be put at a competitive disadvantage if its competitors in the small modular reactor market become aware of its proprietary information. In addition, GmP has contractual relationships with B&W mPower regarding proprietary information, and GmP is contractually obligated to seek confidential and proprietary treatment of such information.

e) The proprietary information sought to be withheld from public disclosure is identified and is marked as proprietary as it appears in the materials.

f) The information was transmitted to the NRC in confidence and under the provisions of 10 CFR 2.390; it is to be received in confidence by the NRC.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is a true and correct statement of facts.

[signature]

Peter S. Hastings

Subscribed and sworn to before me this 13th day of January 2014.

Virginia Ann Zipperer
NOTARY PUBLIC
Commonwealth of Virginia
Reg. # 7254227
My Commission Expires Feb. 28, 2017

Virginia Ann Zipperer

Notary Public

My commission expires: 2/28/2017

Enclosure 4
mPower NSSS Update Slides (Redacted)

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NSSS Update

January 28, 2014

(Redacted Version)

This material is based upon work supported by the Department of Energy under Award Number DE-NE0000583.

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Agenda

PRELIMINARY

Subject	Time
Introduction • Purpose/Objective • Background • NI Systems Safety Strategy	8:30AM-9AM
ECC Update • ECC ADV and Injection Configuration Changes • PRA Insights with respect to ECC Changes	9AM-10:30AM
Break	10:30AM-10:45AM
RCI System Overview	10:45AM – Noon
Lunch	Noon-1PM
IIV Design Update and Application of Break Exclusion Principles to the B&W mPower™ Reactor Design	1PM-1:30PM
DRAP Update	1:30PM-2:30PM
Break	2:30PM-2:45PM
ASME Code Update (48 month operating cycle challenges)	2:45PM-4PM
Conclusions/Questions	4PM-Closing

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Purpose/Objective

- Discuss the safety strategy of the mPower reactor
- Provide an update on the ECC
- Provide an overview of the RCI system and its related functions
- Provide update on the IV design and outline of the Application of Break Exclusion Principles to the B&W™ mPower Reactor Design
- Provide an update on the DRAP process and results
- Update the NRC staff on mPower interactions with ASME Committees and actions being taken to address 48 month fuel cycle challenges.
- Obtain NRC comments/feedback

NSSS Systems

System	Function	Function	Function	Function	Function	Function

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CNX – Auxiliary Condenser System
RCI – Reactor Coolant Inventory and Purification System
RCS – Reactor Coolant System
ECC – Emergency Core Cooling System

Nonsafety-Related
Safety-Related

 [Proprietary per Affidavit 4(a)-(f)]

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Robust Defense-in-Depth Strategy

PRELIMINARY

[

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 [Proprietary per Affidavit 4(a)-(f)]

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Robust Defense-in-Depth Strategy

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PRELIMINARY

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Integral Isolation Valves

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 [Proprietary per Affidavit 4(a)-(f)]

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System Overview

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ECC Design Update

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ECC Design Update

- ECC Performance
  - Overview and Objectives
- ADV Configuration
  - Valve Selection
  - Layout
- EPRV Design Update
  - Concept
  - Testing

ECC System Overview

- Performs safety-related functions without operator action, AC power
  - RCS automatic depressurization
  - Emergency core cooling injection
  - Long-term core cooling
  - Emergency decay heat removal
- [

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May 2013 Design

PRELIMINARY

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 [Proprietary per Affidavit 4(a)-(f)]

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Current ECC Design

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 [Proprietary per Affidavit 4(a)-(f)]

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Summary of Changes

PRELIMINARY

- ADV Configuration

[

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- EPRV

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 [Proprietary per Affidavit 4(a)-(f)]

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Layout Comparison

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PRELIMINARY

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ADV Selection Design Change

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ADV Selection Design Change (Cont'd)

- Identification of challenges and shortcomings with air-operated ball valves used in ADV application
  - NRC feedback
  - FMEA
  - Lack of OE
  - EQ, Testing Challenges
- Design Objectives
  - Continue to follow PRA guidance and maintain diversity in design
  - Evaluate best options for diversity

Continued improvement on plant safety

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Potential Alternatives for Diversity

Actuator Type	Pros	Cons	Total CDF	ECC Only CDF

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PRELIMINARY

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Results of ECC Design Summit Meeting

PRELIMINARY

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Actuator Comparison

Criteria	Air-Operator	Squib

[ ]

PRELIMINARY

 [Proprietary per Affidavit 4(a)-(f)]

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Next Steps

- [

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- Incorporate regulatory lessons learned and operating experience to design process
  - EQ, functional testing
  - Implementation of design process and control

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Emergency Pressure Regulating Valve

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ECC Modification to Enhance Long-Term Operation

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 [Proprietary per Affidavit 4(a)-(f)]

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EPRV Design Updates

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 [Proprietary per Affidavit 4(a)-(f)]

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EPRV Design Updates

- Valve selection

[

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- Environmental Qualification

[ ]

- In-service Testing

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Conclusions

- Design is risk-informed

[

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- Design uses existing technology
  - Considers operating experience, IST, EQ

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Reactor Coolant Inventory and Purification System (RCI)

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RCI System Configuration

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 [Proprietary per Affidavit 4(a)-(f)]

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RCI Functions

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- Non Safety-Related
  - Purification
  - Inventory control
  - Residual heat removal (RHR)
  - High pressure decay heat removal (HPDHR)
- Other
  - Defense-in-depth boron injection
  - Refueling inventory transfers
- Safety-Related
  - Containment isolation
  - RCPB Integrity

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Purification

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Degasification

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Inventory Addition

[

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Inventory Reduction

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 [Proprietary per Affidavit 4(a)-(f)]

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RHR

[

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 [Proprietary per Affidavit 4(a)-(f)]

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High Pressure Decay Heat Removal

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RCI System Classification

- HPDHR/RHR – Non Safety Related

[

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- Inventory Control – Non Safety Related

[

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RCI ASME Section III Class Breaks

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Reactor Coolant Pressure Boundary

PRELIMINARY

- In accordance with 10 CFR 50.2 the RCPB extends from RCS through outer containment isolation valves
- Consistent with previously approved 10 CFR 50.55a(a)(3) alternatives,

[

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- Technical approach consistent with Section 5.2.1 of NUREG-1793

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Reactor Coolant Pressure Boundary (Cont'd)

- Alternate Design Justification for Quality Group D

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RCI Summary

- Non-Safety System
  - ECC credited for performing all safety-related injection and decay heat removal functions
  - RCI provides non-safety investment protection function preventing ECC actuation
- Alternate classification approach to RCPB

[ ]

  - Alternate classification consistent with 10CFR50.55a(a)(3) and NUREG-1793

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PRELIMINARY

IIV Design Update

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Previous Design

PRELIMINARY

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 [Proprietary per Affidavit 4(a)-(f)]

Revised Integral Isolation Valve Arrangement

[

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 [Proprietary per Affidavit 4(a)-(f)]

Basis for Change

Change RCI Makeup IIVs to [

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Purification and RHR IIVs

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Outline of Application of Break Exclusion Principles for B&W mPower Design

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Background

- At a meeting with NRC on 11/19/13, NRC provided GmP with feedback on the recently submitted IIV Technical Report.
- NRC stated that the technical recent report did not provide sufficient justification for the assertion that a

[

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- NRC suggested that GmP submit supplemental justification in the form of a Topical Report (TR) that would enable the regulatory to develop an SER on information in that report.
- Outline of proposed methodology is provided in the following slide

 [Proprietary per Affidavit 4(a)-(f)]

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Outline

1. **Introduction**
   Describe the methodology and criteria used to determine the locations of breaks and cracks for the B&W mPower reactor and to demonstrate that a
   [ ]

2. **Scope/Definition Including Criteria Used to Define Break and Crack Location and Configuration**
   BTP 3-4 defines the criteria used for postulating the locations of breaks and leakage cracks in high-energy lines and leakage cracks in moderate-energy lines.

3. **Failure/Damage Mechanism Assessment (Using Criteria in SRP 3.6.2 and BTP 3-4)**
   A. Break Locations in Containment Penetration Areas
   B. Break Locations in Areas other than Containment Penetration Areas
   C. Types of Breaks and Leakage Cracks (e.g., Circumferential Pipe Breaks, Longitudinal Pipe Breaks, Leakage Cracks)

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Outline (Cont'd)

4. **Consequence Evaluation**
   The consequence of failure of each circumferential weld in the mPower reactor scope will be evaluated (i.e. pipe whip, jet impingement and other impacts). Both circumferential and longitudinal breaks are postulated at each weld. The criteria for postulating and analyzing pipe whip and jet impingement impacts are to be consistent with existing plant high-energy pipe break analyses (e.g., SRP 3.6.2).

5. **PRA Assessment and Risk Evaluation**

6. **Demonstration Why a Failure of the [ ] is not Credible, Based on the Above Methodology**

7. **Leak Detection Instrumentation**
8. **Augmented Inspection**
9. **Conclusions**
10. **References**
11. **Figures/Tables**

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Path Forward

- Obtain NRC feedback on outline
- Further engagement with NRC on the development of this report
- Plan to submit mid 2nd quarter of 2014

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Design Reliability Assurance Program Status Update

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Overview

- Outline
  - D-RAP Overview
  - D-RAP Scope
  - D-RAP Process
  - Preliminary Results

- The goal of a D-RAP is to provide a high degree of confidence that SSCs that are risk-significant (or significant contributors to plant safety) are available when needed.

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Scope

- Risk significance in the context of the D-RAP means that failure of SSC to perform its intended function would result in a significant increase in the probability of:
  - fuel damage (core or fuel pool)
  - radiological release in the event of fuel damage

- Includes SSCs whose failure would significantly impair the ability of plant staff to conduct emergency operations

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Process

Identify D-RAP SSCs via:

- PRA

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- Deterministic

- Expert Panels – have ultimate authority for D-RAP scope

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Preliminary Results (Example)

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Next Steps

- Complete incorporation of PRA insights
- Complete Expert Panels
- Monitor design and PRA changes that might affect D-RAP scope

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ASME Code Update
(48 month operating cycle challenges)

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Feedback from NRC at Previous Meeting on 2/28/13

PRELIMINARY

- Current Regulations (e.g., 10 CFR 50.55a, ASME Section XI, ASME OM Code) pose several challenges to the mPower Reactor 48-month operating cycle.

- Engage with ASME to address the mPower design development of code cases for our design.

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Interactions with ASME

- ASME Engagement
  - ASME Executive Committee on Strategy (8/11/11)
  - ASME 2011 SMR Symposium, Plenary Session (9/29/11)
  - ASME Section XI Committee (2/6/12)
  - ANSI-NIST NESCC Meeting (7/17/12)
  - ASME Section XI Meetings:
    - 5/13-16/2013
    - 8/12-16/2013
    - 10/25-11/1/2013
    - 02/7-14/2014
  - ASME OM Code Committee Meetings:
    - 6/18-23/2013
    - 12/9-13/2013

mPower Continues to Increase Participation on ASME Code Committees

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Regulatory Challenges to a 48-Month Operating Cycle

PRELIMINARY

- ASME OM Code (Inservice Testing), 2004 Edition (2006 Addenda) of the OM code
- ASME Section XI (Inservice Inspection), ASME BPV 2007 Code Edition with the 2008 Addenda
- 10 CFR 50, Appendix J (Containment Leak Rate Testing)
- EPRI Steam Generator Tube Inspection Guidelines
- Qualified Instrumentation Drift Data (Technical Specification Surveillances)

mPower will comply with Code Requirements but testing frequencies pose a challenge

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ASME OM Code Challenges

ASME OM Code Challenges

Subject	Requirement
Category A Valves other than Containment Isolation valves with leakage based on App. J Program	Perform leak rate test every 2 years
[	]
Class 1 Pressure Relief Valves and PWR MSSVs	A minimum of 20% of the valves from each valve group shall be tested within any 24- month interval

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ASME OM Code Path Forward

- Performance based Code Cases being developed to extend testing frequency to 4 years for:
  - Leakage testing of Category A valves
  - Testing of Class 1 pressure relief valves and PWR MSSVs
  - [ ]

- Code Cases for leakage testing of Category A valves and testing of Class 1 pressure relief valves and MSSVs have been reviewed by the members of the ASME O&M task group for New Build Reactors (TG-NROMC) and comments are being resolved

- Code Case on testing and examination of squib (explosively actuated) valves is in progress
  - Submitted to the (TG-NROMC) in January 2014.

Participation and Interaction with ASME Code committees has led to the development of the Code Cases

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ASME Section XI Code Challenges

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ASME Section XI Challenges and Path Forward

- Code currently requires 10 year Inspection Intervals with inspections periods of 3, 7 & 10 years within those intervals
- As an alternative, a code case has been submitted to the Code Committee for approval to:
  - Decrease the inspection intervals to 8 years
  - Revise the intermediate inspection period lengths to 4 years
  - Invoke the 1 year extension allowance to both the interval and periods as specified in IWA-2430

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Appendix J Containment Leak Rate Testing Challenges

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Appendix J Containment Leak Rate Testing Challenges

Category	Description	Test Frequency
Type A	Integrated Leak Rate Test	After the preoperational leakage tests, a set of 3 tests shall be performed during each 10-year period
Type B	Local Leakage Rate Test	Except for air locks, tests shall be performed during refueling outages, or other convenient intervals, but in no case at intervals greater than 2 years
Type C	Local Leakage Rate Test for containment isolation valves	Types shall be performed during each refueling outage but in no case at intervals greater than 2 years

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Appendix J Containment Leak Rate Testing Path Forward

- NEI 94-01, Revision 3-A describes an acceptable approach for implementing Option B to 10 CFR 50, Appendix J
- NEI 94-01 has been endorsed by Regulatory Guide 1.163 (September1995) and NRC Safety Evaluations of June 25, 2008 and June 8, 2012
- Justification of extending test intervals is based on the performance history and risk insights
- Based upon 2 consecutive successful tests, Option B allows:
  - Type A test frequency to be extended to 1 test every 10 years
  - Type B tests to be extended up to a maximum of 10 years
  - Type C tests to be extended up to 5 years

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EPRI Steam Generator Tube Inspection Challenges

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EPRI Steam Generator Tube Inspection Challenges and Path Forward

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- EPRI recommends that the SG tubes be inspected every 24 effective full power months (EFPM) or refueling outage (whichever occurs first), such that 100% of the tubes are inspected every 60 EFPM
- The DCA will propose:
  - Initially inspect 100 percent of the tubes in each SG at 24 EFPM or one refueling outage (whichever is less).
  - Inspect 100 percent of the tubes at the next 24 EFPM and thereafter, 48 effective full power months. The next sequential period is considered to begin after the first ISI of the SG. No SG will operate for more than 72 effective full power months or three refueling outages (whichever is less) without being inspected.
  - If crack indications are found in any SG tube, then the next inspection for each SG for the degradation mechanism that caused the crack indication will not exceed 24 effective full power months or one refueling outage (whichever is less).

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Extended Instrument Drift Qualification Challenges

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Extended Instrument Drift Qualification Challenges and Path Forward

- Various Technical Specifications require testing every 24 months
- Currently, instruments are typically qualified for ~30 months of drift
- Working with vendors to qualify instruments for longer qualification periods consistent with the proposed operating cycle

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Regulatory Path Forward to Address 48 Month Operating Cycle Challenges

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Regulatory Path Forward

- Continued interaction with ASME and NRC on development of code cases
- Depending on timing of ASME committee approval of the proposed Code Cases, GmP may request NRC approval of the code cases as part of the DCA:
  - Normally takes 2 years for NRC to review and endorse code cases as part of updates to RG 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III," RG 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," and RG 1.192, "Operation and Maintenance (OM) Code Case Acceptability, ASME OM Code."
  - Precedent exists for NRC review of code cases as part of the DCA (e.g., Code N-782 for ESBWR)

DCA will comply with Code Requirements

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Questions

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Abbreviations / Acronyms

AC – Alternating Current
ADV – Automatic Depressurization Valve
ASME – American Society of Mechanical Engineers
CCRAW – Common Cause Risk Achievement Worth
CCW – Component Cooling Water
CDF – Core Damage Frequency
DBE – Design Basis Event
DC – Direct Current
DCA – Design Certification Application
DRAP – Design Reliability Assurance Program
ECC – Emergency Core Cooling System
EFPM – Effective Full-Power Month
EOP – Emergency Operating Procedure
EPRI – Electric Power Research Institute
EPRV – Emergency Pressure Regulating Valve
EQ – Environmental Qualification

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Abbreviations / Acronyms

PRELIMINARY

FV – Fussell Vesely

GSI – Generic Safety Issue

HOV – Hydraulic Operated Valve

HP – High Pressure

HPDHR – High Pressure Decay Heat Removal

IIV – Integral Isolation Valve

IPIT – Intermediate Pressure Injection Tank

ISI – Inservice Inspection

IST – Inservice Testing

JOG – Joint Owners Group

LP – Low Pressure

LOCA – Loss-of-Coolant Accident

LTOP – Low-Temperature Overpressure Protection

MOV – Motor Operated Valve

NI – Nuclear Island

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Abbreviations / Acronyms

PRELIMINARY

NRC – Nuclear Regulatory Commission
NSSS – Nuclear Steam Supply System
OTS – Off the Shelf
PRA – Probabilistic Risk Assessment
PSV – Pressurizer Safety Valve
RAW – Risk Assessment Worth
RCPB – Reactor Coolant Pressure Boundary
RCI – Reactor Core Isolation
RCS – Reactor Coolant System
RHR – Residual Heat Removal
RTNSS – Regulatory Treatment of Nonsafety Systems
RWST – Refueling Water Storage Tank
SER – Safety Evaluation Report
SSC – Structure, System, and Component
TR – Topical Report
TS – Technical Specification

Enclosure 5
Gale Code Update Slides (Redacted)

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Calculation of Coolant and Effluent Activities

(Redacted Version)

January 29, 2014

This material is based upon work supported by the Department of Energy under Award Number DE-NE0000583.

This is a pre-application document and includes preliminary B&W mPower reactor design or design supporting information and is subject to further internal review, revision, or verification.

General Approach

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- Specific NRC issues are addressed on the following slides

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Scaling of Power

Issue

- Scaling of parameters based on thermal power is overly conservative for SMRs

Response

- Coolant and effluent concentrations will be based on

[

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Nuclide Concentrations

Issue

- Concentrations in GALE are based on outdated data from 1970s plants

Response

- RCS concentrations will be [

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[Proprietary per Affidavit 4(a) – (f)]

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Selection of Nuclides

Issue

- Nuclides are hard-wired in GALE, omitting environmentally mobile nuclides such as I-129 and Tc-99

Response

- Coolant concentrations will be[

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Credit for Treatment Methods

Issue

- GALE does not allow credit for features such as gaseous effluent filters

Response

- [

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Retention of Noble Gases

Issue

- Dynamic adsorption coefficients in GALE do not reflect current industry experience

Response

- Adsorption coefficients [

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Source for Anticipated Operational Occurrences

Issue

- GALE uses an outdated AOO source term based on operational data from 1970s plants

Response

- More recent annual effluent reports [

]will be utilized to obtain current industry data on unplanned releases

 [Proprietary per Affidavit 4(a) – (f)]

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Plant Capacity Factor

Issue

- Capacity factor of 0.80 is hard-coded into GALE

Response

- An mPower design-specific capacity factor will be used