Attachment 3

B&W nuclear energy

Commissioner Apostolakis Visit to Generation mPower Office

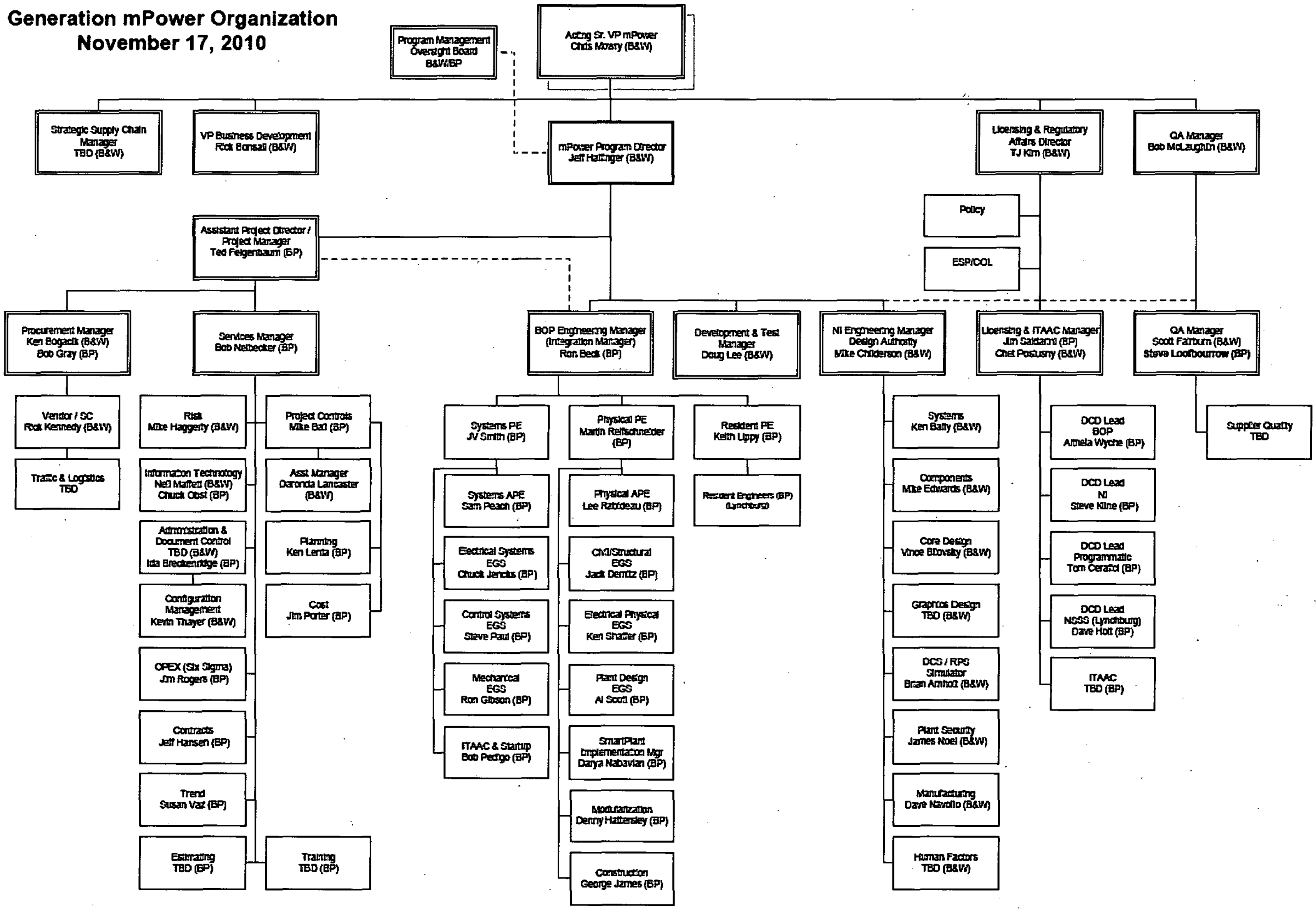
Ramsey Place, Lynchburg, Virginia – December 7, 2010

AGENDA

- Introductions, Facility Tour, and Lunch
- Generation mPower Organization
- B&W mPower™ Reactor Design Overview
- Test Programs
- Break
- Licensing
- PRA
- Conclusion and Closing Statements

Generation mPower Organization Chart and Key Functions

Generation mPower Organization
November 17, 2010



B&W and Bechtel Alliance

- Announced July 14, 2010
- Industry Leaders and Resources in Nuclear Technology, Manufacturing and Construction
- B&W Focus on NSSS and Nuclear Island
- Bechtel Focus on BOP and Turbine Island, as Well as Engineering and Project Management
- Bechtel Engineering and Licensing Staff Based in Lynchburg and in Frederick, Maryland
- Generation mPower LLC Being Formed

B&W mPower Reactor Lead Plant Baseline Schedule

10 CFR Part 52 Process

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Resources Dedicated to B&W mPower Reactor Development

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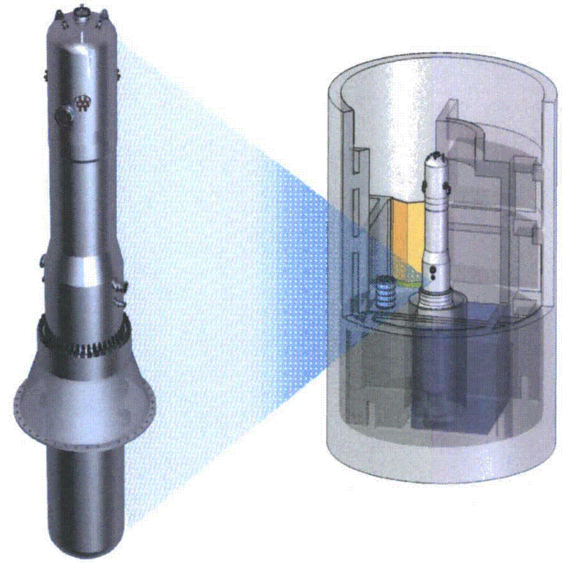


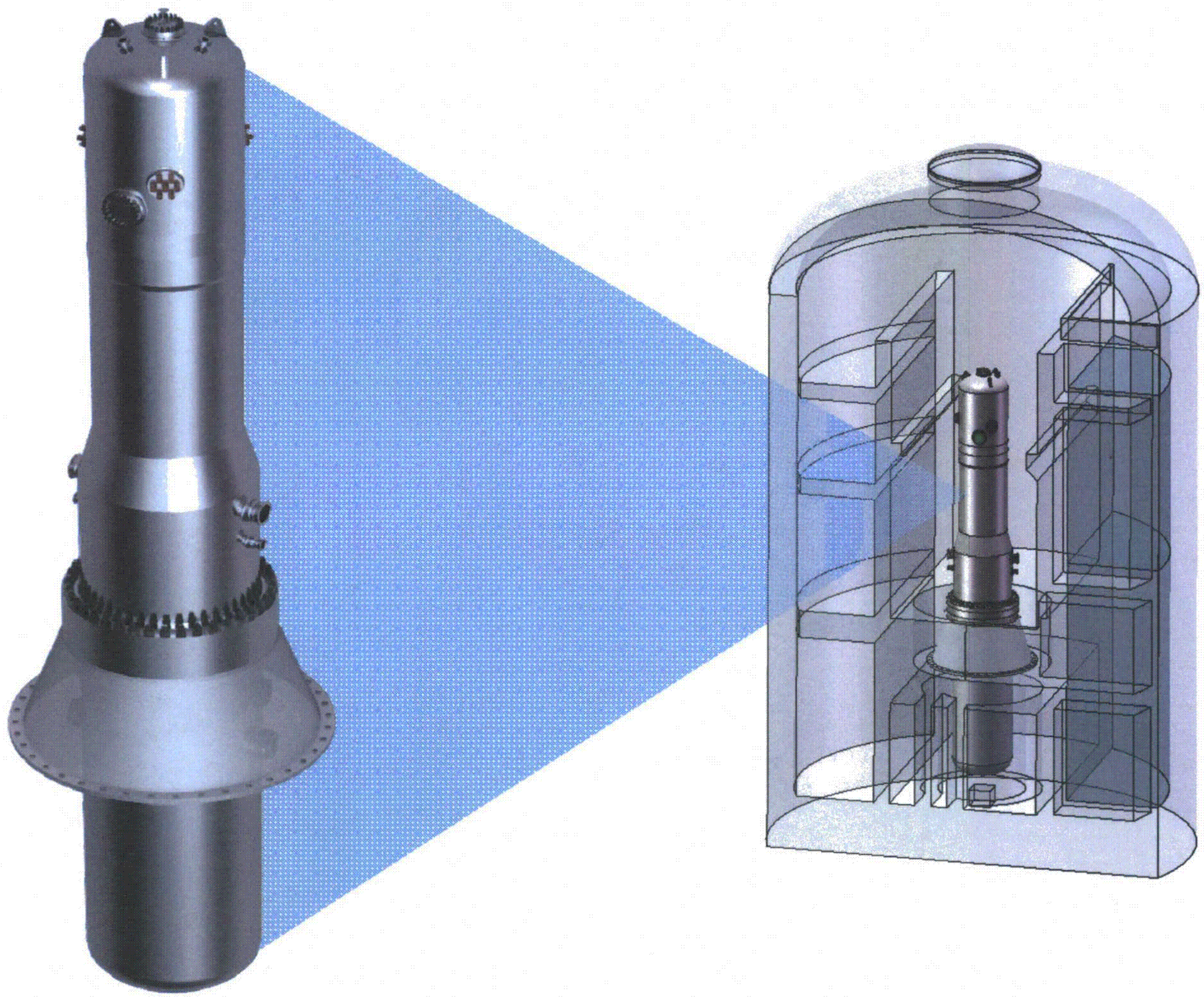
BOP: Balance of Plant
CRDM: Control Rod Drive Mechanism
DHRS: Decay Heat Removal System
DCD: Design Certification Document
DCS: Distributed Control System
EPC: Engineer, Procure, Construct
PRA: Probabilistic Risk Analysis

Industry Advisory Council (IAC)

- Voluntary Association of Energy Companies
  - ➢Provide Advice and Feedback
  - ➢Focus on Design and Licensing Aspects of B&W mPower Reactor
- 14 Members
  - ➢12 Domestic, 2 International
  - ➢Additional Members under Consideration
- Structure
  - ➢Executive Oversight Committee (EOC)
  - ➢Advisory Committee (AC)
- Semi-Annual EOC Meetings
  - ➢Program Status Update
  - ➢Facility Tours

B&W mPower Reactor Consortium

- Core Utilities "Committed" to B&W mPower Reactor Development
  - Significant Funding and People/Resource Commitment to Support Initiatives
  - Founding Members Include B&W, TVA, FirstEnergy and Oglethorpe
- Formal Structure to "Demonstrate Seriousness" of Utility Industry
  - Documents Desire to Proceed through Tollgates Toward Goal of 1+ Lead Plants by 2020
  - Necessary to Receive NRC Licensing Priority, DOE Cost-Sharing Program Award
- Framework to Pursue "User-Centric" Development
  - Refine Requirements for a Solution that Will Meet Needs of Members
  - Pursue Key Licensing/Policy Changes with NRC that Enhance B&W mPower Reactor Benefits
  - Pursue Award of DOE Cost-Sharing Program for LWR SMR Development
  - Resource Design Centered Working Group to Provide Input/Feedback on Plant Design Decisions
- Organizational Elements in Place and Functioning
  - Executive Board
  - Management Committee
  - Working Team Supported by All Members



Overview of the B&W mPower Reactor Design

Overview of the B&W mPower Reactor Design

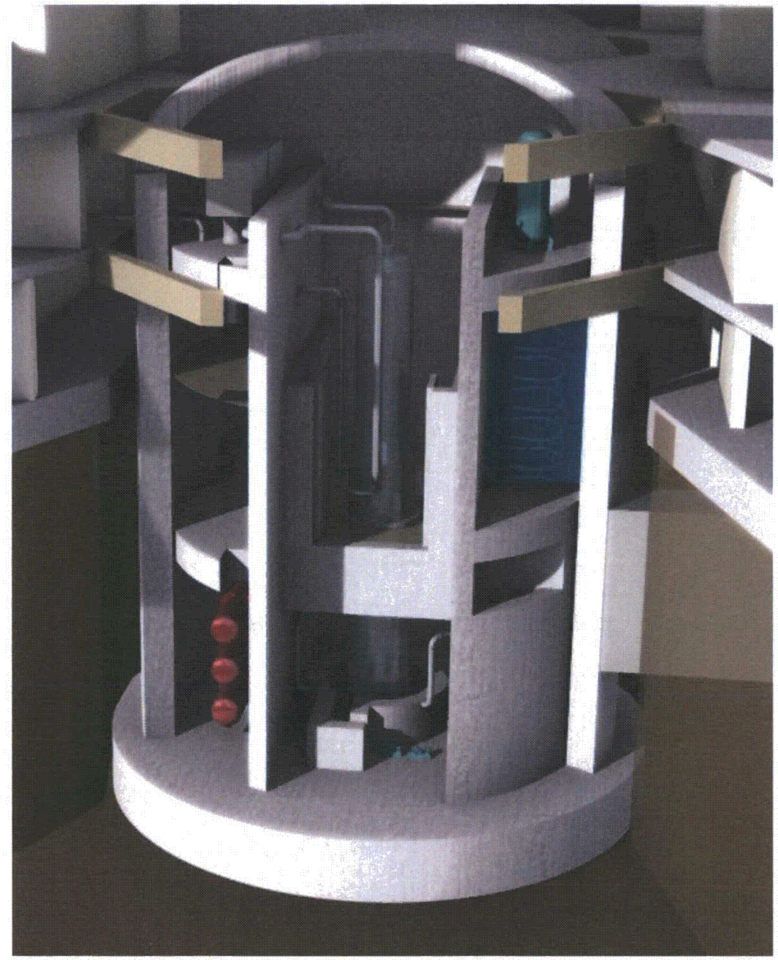
- High-Level Program Overview
- Technology Overview
- Summary

High-Level Requirements

- 125 MWe Nominal Output per Module and 60-Year Plant Life
- NSSS Forging Diameter Allows Domestic Forgings and Unrestricted Rail Shipment
- Passive Safety Requirements – Emergency (Diesel) Power Not Required
  - Minimize Primary Coolant Penetrations, Maximize Elevation of Penetrations
  - Large Reactor Coolant Inventory
  - Low Core Power Density
- Standard Fuel (Less than 5% U-235)
- Long Fuel Cycle, 4+ Year Core Life
- Spent Fuel Storage on Site for Life of Plant
- [ ] for Normal Reactivity Control
- Conventional/Off-the-Shelf Balance of Plant Systems and Components
- Accommodate Air-Cooled Condensers, as Well as Water-Cooled Condensers
- Flexible Grid Interface (50 Hz or 60 Hz)
- Digital Instrumentation and Controls Compliant with NRC Regulations

Containment Requirements

- Underground Containment and Fuel Storage Buildings
  - ➢Favorable Seismic Response
  - ➢Missile Protection
- Environment Suitable for Human Occupancy During Normal Operation
- Simultaneous Refueling and NSSS Equipment Inspections
- Leakage Free
- Volume Sufficient to Limit Internal Pressure for All Design Basis Accidents



Conceptual Plant Layout (Plan View)

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Integral Nuclear Steam Supply System

- Integrates Core, Steam Generator, and Pressurizer into a Single Vessel
- Control Rod Drive Mechanisms and Reactor Coolant Pumps Inside Vessel
- Reactor Coolant Pressure Boundary Penetration Size and Location Minimize Coolant Loss During LOCA – Core Remains Covered Throughout the Design Basis LOCA

Integral Design Reduces Overall Plant Complexity and Enhances Safety

Overall Reactor Arrangement

[[

[ ]°F at [ ] psia

[ ]°F Superheated Steam

[ ]°F Feedwater

[ ] psia,

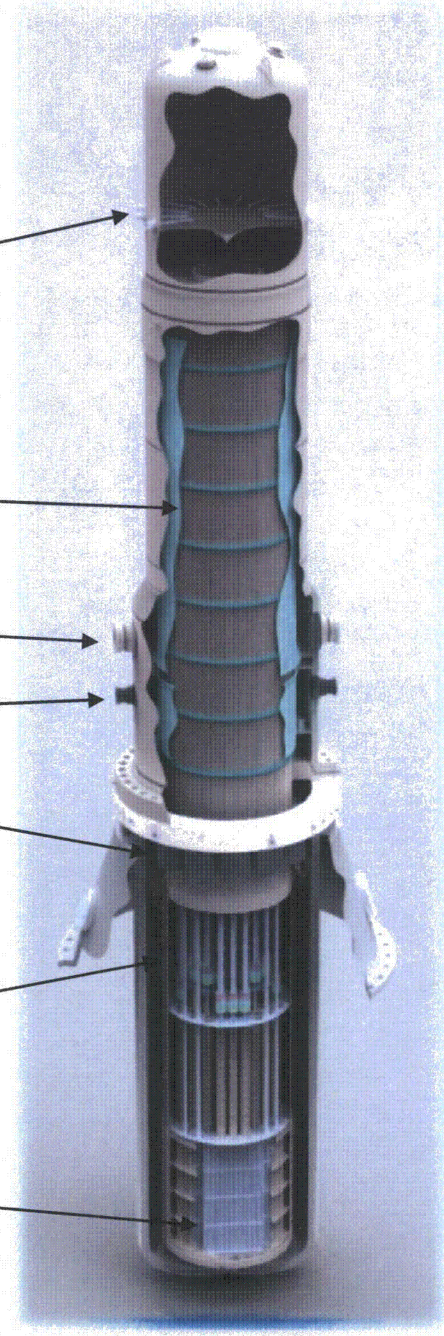
[ ]°F Core Outlet

[ ]°F Core Inlet

[ ]M lbm/hr

]]

Primary Loop **Secondary Loop**



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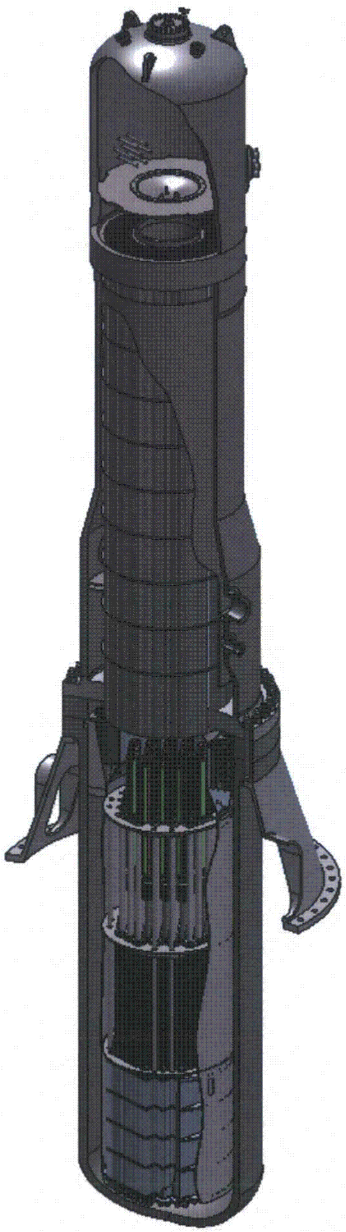
Overall Safety Approach

- Defense in Depth
  - ➢Multiple Barriers to Radioactive Release
  - ➢Multiple Systems to Remove Heat to Protect those Barriers

Fuel Pellet ➡ Fuel Clad ➡ RCS Pressure Boundary ➡ Containment

- Passive Safety Systems
  - ➢Safety Systems Rely on Passive Principles
    - Incorporate Large Heat Capacity (RCS, Containment)
    - Natural Circulation (ECCS)
    - Water Evaporation (Ultimate Heat Sink)
  - ➢Safety Systems Initiated Using Stored Energy to Operate [ ] Valves
  - ➢Once Initiated, Passive Safety Systems Protect the Core for a Minimum of 72 Hours without Operator Action

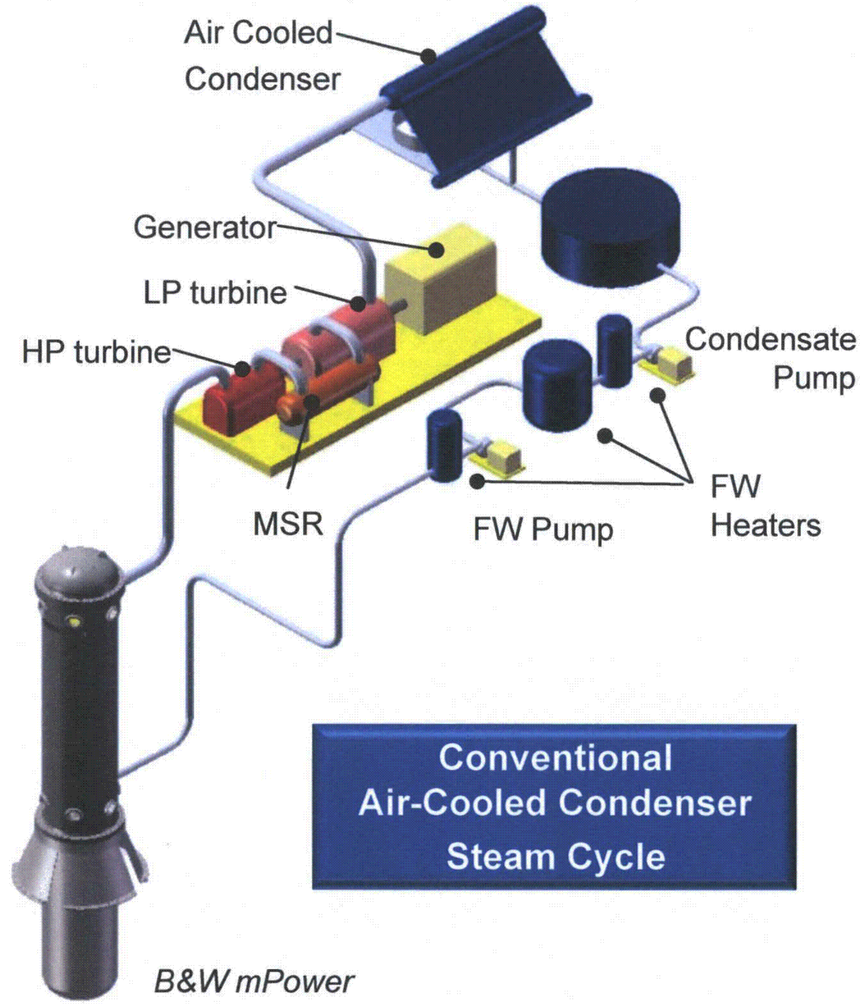


Inherent Safety Features

- Low Core Linear Heat Rate
  - [
  -]
- Large Reactor Coolant System Volume
  - Large RCS Volume [ ]
  - More Coolant [ ]
- Small Penetrations at High Elevation
  - High Penetration Locations [ ]
  - Small Penetrations [ ]

Balance of Plant Design

- 125 Mwe Nominal Output per Module
  - Air-Cooled Condenser (Baseline)
  - Water-Cooled Condenser (Optional)
- Conventional Steam Cycle Equipment (Small, Easy to Maintain and Replace)
- BOP Operation Not Credited for Design Basis Accidents

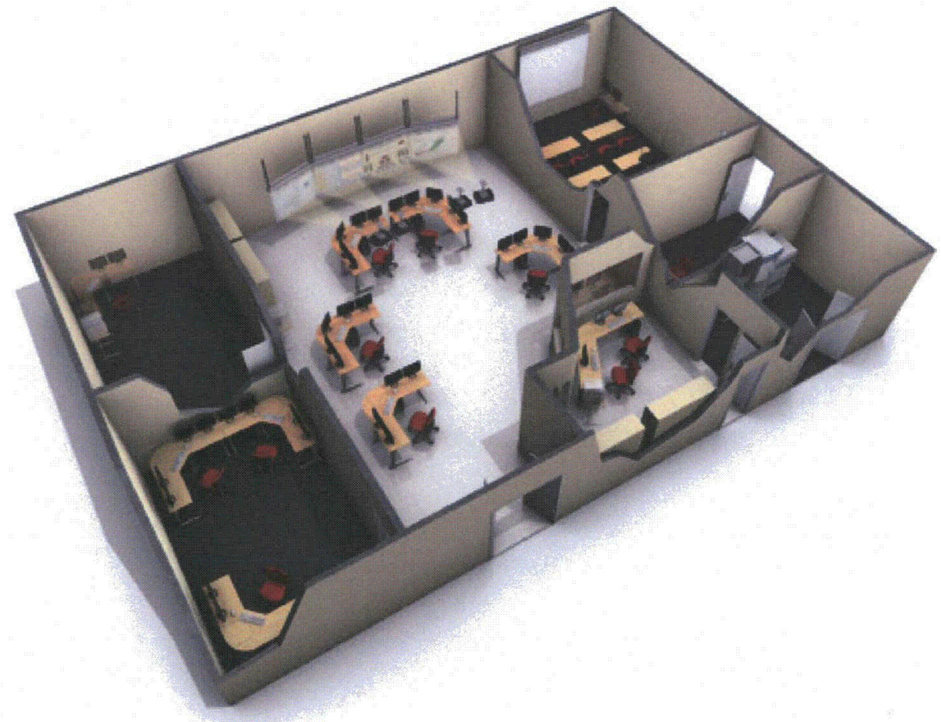


B&W mPower
125 MWe Module

Conventional Air-Cooled Condenser Steam Cycle

Instrumentation and Controls

- State of the Art Digital System
- Provides Monitoring, Control and Protection Functions
- Separate Safety and Non-Safety Systems
- Implement Lessons Learned from Current Licensing Activities
- Northrop Grumman under Contract to Develop Digital Control System Architecture



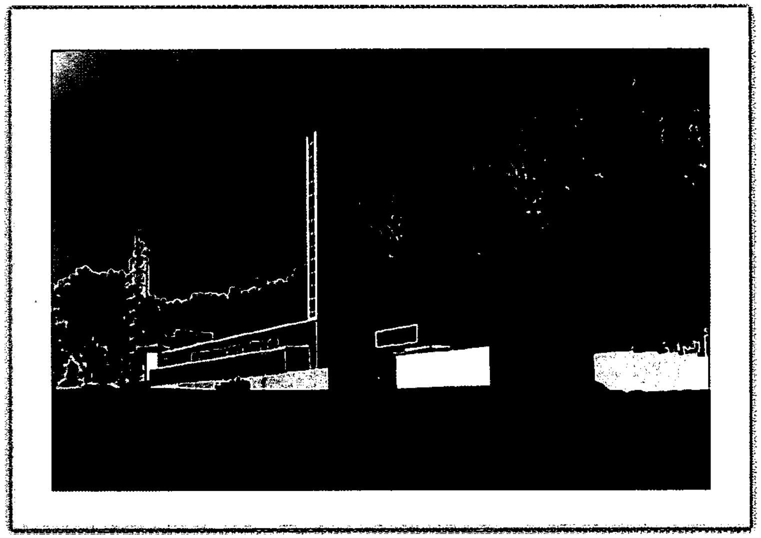
B&W mPower Reactor Design Summary

- NSSS Utilizes an Integral PWR Design
  - ➢Uses a Single Integral Economizer Once Through Steam Generator to Produce Superheated Steam
  - ➢Internal Reactor Coolant Pumps and Control Rod Drive Mechanisms
  - ➢Internal Pressurizer
- Passive Safety Systems, Inherent NSSS Safety Features
- Long Operating Cycle [ ]
- Underground Containment
- Spent Fuel Storage on Site for Life of Plant
- Plants for Multi-Module Facilities [ ]

Test Programs

Development Testing Programs

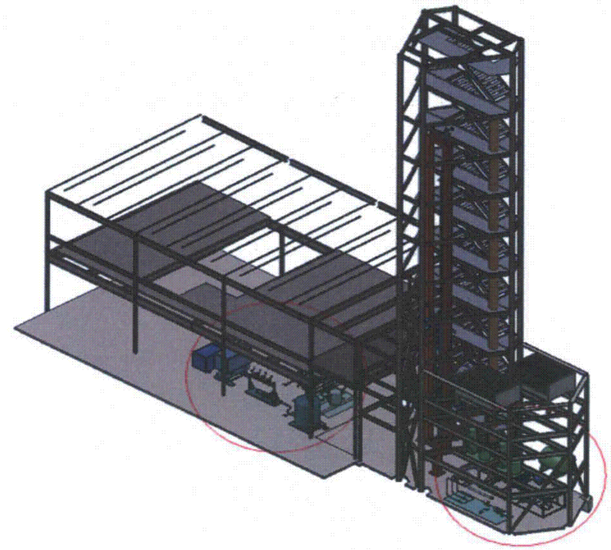
- Component Tests
  - ➢[
  - ➢
  - ➢
  - ➢
  - ➢
  - ➢]
- Integrated Systems Test (IST)
  - ➢[
  - ➢
  - ➢
  - ➢
  - ➢]



Center for Advanced Engineering Research (CAER)

IST Objectives

- [
-]
- Computer Code Validation
- Licensing Support
- [ ]
- Design Enhancements
- [
-]
- Demonstration to Potential Customers



Integral Reactor Phenomena

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B&W mPower Reactor and IST Loop

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Systems Simulated

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Test Scope

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Status

- Design
  - [
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- Facility Construction at CAER
  - [
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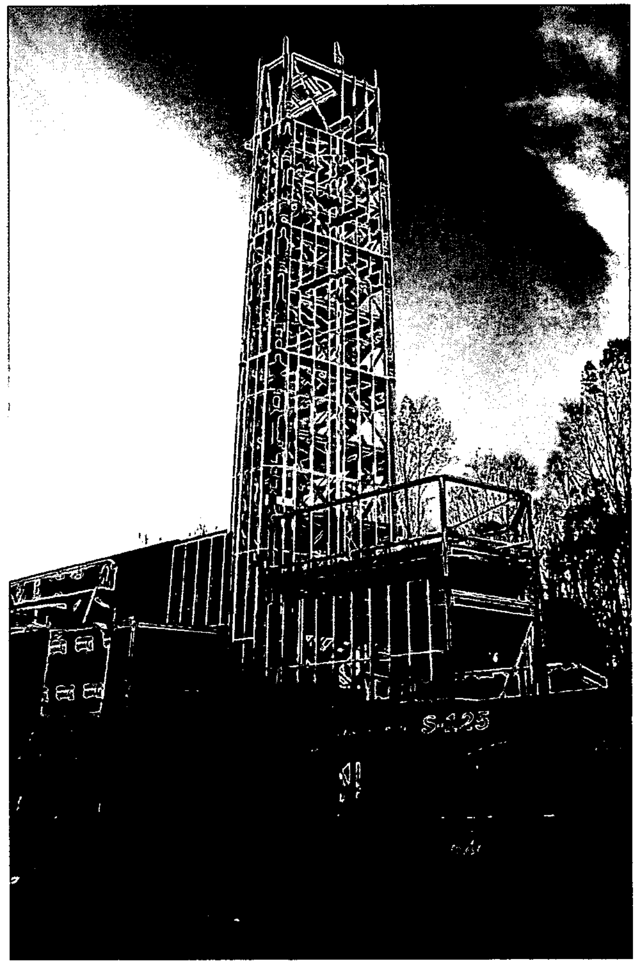
- Analysis
  - [
  -]



Licensing

Licensing

- Design Certification
  - ➢Proven LWR Technology and Existing Regulatory Framework
  - ➢Minimize Deviations and Exemptions
  - ➢Leverage GEN III+ Licensing Experience – Digital I&C, ITAAC, Cyber Security
  - ➢Maximize Pre-Application Efforts – LTRs, Technical Reports, White Papers
  - ➢Customer Input, Including Consortium, IAC and EPRI URD
  - ➢Comprehensive Testing, V&V, PIRT and Independent Reviews

- Construction Permit and Operating License for Lead Plant
  - ➢TVA Key Assumptions Letter (November 5, 2010)

- Generic Small Modular Reactor Policy Issues
  - ➢Regulatory Policy Issue Potentially Affecting Economic Viability of SMRs
  - ➢Timely Resolution of the Issues Required for a "Build" Decision

Licensing Update – Design Certification

- 2010 Engagements and Accomplishments
  - ➢Submitted Seven Licensing Topical/Technical Reports to NRC
  - ➢Conducted Six Meetings with NRC Technical Staff
  - ➢Conducted Numerous Drop-In Meetings
- Going Forward
  - ➢Maintain Awareness of Current Industry Issues (For Example, Digital I&C, ITAAC, etc.)
  - ➢Continue to Engage NRC Frequently --- No Surprises

Topical and Technical Reports Submitted

- Quality Assurance Program for Design Certification[1] (3/10)
- CHF Correlation Test and Development Plan[2] (4/10)
- Design Overview[2] (5/10)
- Integrated Systems Test Program[2] (6/10)
- Core Nuclear Design Codes & Methods Qualification[1] (8/10)
- Instrument Setpoint Methodology[1] (10/10)
- CRDM Design Details and Development Plan[2] (10/10)

1 = Topical Report, 2 = Technical Report

Planned Topical Report Submittals

Fuel Assembly Mechanical Design Criteria	Third Quarter 2011
HFE/HSI Program	Third Quarter 2011
Core Thermal-Hydraulic Analysis Methodology	Fourth Quarter 2011
Accident Analysis Codes and Methodology	Fourth Quarter 2011
I&C Software Quality Assurance and Program Plan	Fourth Quarter 2011
Small Break LOCA Accident Analysis Methodology	First Quarter 2012
I&C System Defense-in-Depth and Diversity	Second Quarter 2012
Non-LOCA Accident Analysis Methodology	Second Quarter 2012
Integrated Systems Test (Results)	Second Quarter 2012
Multi-Module Staffing	Second Quarter 2012
Cyber Security Program	Third Quarter 2012
Critical Heat Flux Test and Correlation (Results)	Fourth Quarter 2012
Pressure-Temperature Limits Methodology	Fourth Quarter 2012
Core Operating Limits Methodology	Fourth Quarter 2012
Fuel Performance Analytical Methodology	Fourth Quarter 2012
Probabilistic Risk Analysis	Fourth Quarter 2012

Planned Technical Report Submittals

Security Design Assessment and Program Plan	December 2010
Design Overview (Revision 1)	Second Quarter 2011
IST (Facility Description and Test Plan – Revision 1)	Second Quarter 2011
Design Basis LOCA PIRT	Third Quarter 2011
ECCS Design	Third Quarter 2011
Reactor Coolant Pump Design and Development	Fourth Quarter 2011
Core Nuclear Design	Fourth Quarter 2011
Digital I&C Platform	Second Quarter 2012

Technical Meetings to Date

- Design Overview – March, June, July, September and November 2010
- Integrated System Test Facility and Plans – March, June and September 2010
- Core/Fuel Design – July 2010
- I&C Architecture/Design – November 2010

Planned Technical Meetings

Physical Security Design and Program Plans	December 2010
Reactor Design Overview (Update) Critical Heat Flux Test and Correlation Development	January 2011
Control Rod Drive Mechanism Design and Development Core Nuclear Design Codes and Methods Qualification	February 2011
Reactor Design Overview (Update/Training)	March 2011
Integrated Systems Test Facility and Plans (Update) Design Basis LOCA PIRT Insights/Results	April 2011
I&C Architecture/Design (Update) Accident Analysis Methodology	May 2011
ECCS Design Fuel Assembly Mechanical Design	June 2011

Generic SMR Regulatory Issues

- SMR Regulatory Issues for Resolution
  - SECY-10-0034 Identified 21 Issues
  - ANS Working on Developing White Papers on Selected Issues
  - EPRI Plans to Update URD Volume 1 for SMRs
  - NIC SMR Committee
  - NEI SMR Task Force

- Issues Addressed in NEI SMR Task Force White Papers
  - Offsite Emergency Preparedness (EPZ and Activities)
  - Installation of a New Module Next to an Operating Module
  - SMR Application Format and Content
  - Price-Anderson (Liability)
  - NRC Annual Fees – Submitted
  - Decommissioning Funding – Submitted

Generation mPower Support to Industry Generic Efforts

- Participation in All Public NRC Meetings/Workshops
- Membership on NEI SMR Task Force
- Leadership Role for Sub-Group Efforts on Price-Anderson and Modularity

Generation mPower Specific Planned White Papers (WP), Technical Reports (TR) and Topical Reports

- License Structure for Multi-Module Facilities – WP
- **Defense in Depth into Design** – WP and TR
- PRA in Licensing Process – Topical Report
- **Source Term, Dose Calculations, and Siting** – WP
- Key Component and System Design Issues – Planned Submittal
- Operational Programs and **Staffing** – WP
- Installation of Reactor Modules During Operations – WP
- **Security and Safeguards Requirements** – WP and TR
- **Aircraft Impact Assessments** – WP and TR
- Offsite Emergency Planning Requirements – WP

(Bolded Topics Also Being Addressed by Generation mPower Consortium)

Risk Insights for SMR Reviews

- Discussion of COMSECY at SMR Workshops
- Review of B&W mPower Reactor SSCs by DOE Laboratory Staff
  - B&W mPower Reactor Design Overview Submittal
  - Informal Questions
  - List of SSCs and Proposed Classification
  - Conference Calls and Potential Meeting
- Support for Future Workshops
- Sharing of PRA Insights for B&W mPower Reactor Design
- Interaction on Holistic Risk-Informed Review Framework
- Active Follow-Up to Proposed SRP Changes
- Monitoring of Future Commission Guidance

PRA Overview

Overview

- PRA Essential to Achieve B&W's Commercial Goal of Developing a Safe and Reliable Power Plant
- PRA Supports the Design Certification Application
  - DCD Chapter 19
  - Support for Reliability Assurance Program
  - Support for Other DCD Chapters (For Example, Human-Machine Interface)

Scope of PRA Activities

- Internal Events Risk
- Internal Flooding and Fire Risk
- Seismic Risk
- Other External Events Risk (External Flooding, High Winds, Offsite Hazards, etc.)
- Low Power and Shutdown Risk
- ASME/ANS PRA Standard and RG 1.200 Being Applied

Unique Issues for a Plant Under Design

- The B&W mPower Reactor Design Is Still Evolving, Which Calls for an Iterative Risk Analysis Effort
- PRA Personnel Have Been Involved in Many of the Key Decisions Concerning Plant Safety
  - ECCS and Decay Heat Removal Design Decisions
  - Supported Phenomenon Integrated Ranking Table (PIRT) Evaluation of the Plant LOCA Response

Key Risk Attributes of the B&W mPower Reactor

[

- Integral Reactor Vessel
  - [
  -
  -]
- [

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Key Risk Attributes of the B&W mPower Reactor (Continued)

- Emergency Depressurization System
  - [ ]
- Passive ECCS Design
  - Simple, In-Containment Design Will Have High Reliability

[ ]

Key Risk Attributes of the B&W mPower Reactor (Continued)

- Reactor Cavity Cooling/Injection
  - [
  -]
- Underground Containment
  - Provides Additional Barriers to Radioactive Release

[

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Key Risk Attributes of the B&W mPower Reactor (Continued)

- Reduced Operator Action Following an Event
  - ➢Longer Times Available for Response
  - ➢Simpler Actions to Take
- Reduced Potential for Active Common Cause Failures
  - ➢Reduced Reliance on Pumps, AC Power Systems, etc.

Key Risk Attributes of the B&W mPower Reactor (Continued)

- Non-Safety Systems Available for Accident Mitigation
  - [
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Key Risk Attributes of the B&W mPower Reactor (Continued)

- Passive System Reliability [
  - ➢Passive Systems May Be Subject to Unique Failure Modes
  - ➢Monitoring NRC and Other Research into Passive System Failure Issues
  - ➢[

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PRA Activities

- Internal Events PRA Tasks are Underway
- Initiating Events (IEs) Analysis
  - [
  -
  -]
- Accident Sequence Analysis
  - [
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  -]

PRA Activities (Continued)

- Systems Analysis and Data Analysis Scheduled [
  - ➢
    - ▪
    - ▪]
  - ➢ Latest Generic Data Sources for Current Operating Plants (for Example, NUREG/CR-6928) Will Be Used for Initial Modeling
    - Most Components Are Similar in Design to Those of Current Plants
    - Additional Data Analysis and Sensitivity Analyses Will Be Conducted, as Needed, for Unique Components

PRA Activities (Continued)

- Initial "Risk Estimate"
  - [
  -
  -
    ]
- Risk Insights Training
  - Purpose: Ensure that Design Team Is Aware of Risk Considerations Well Before "Official" Risk Results Are Available [ ]
  - System Designers Informed of Key Risk Insights (from Current Plant PRAs) to Incorporate High Reliability and Availability Attributes "the First Time"
  - Course Contents Include Fundamentals of PRA and Reliability, Important Factors that Influence Risk, Initial B&W mPower Reactor Risk Insights, and Cost-Effective Features Used in Current Plants to Reduce Risk

PRA Activities Schedule

- Internal Events PRA (Level 1)
  - [ ]
- Level 2 PRA (Internal Events)
  - [ ]
- External Events and Low Power/Shutdown (Including Level 2)
  - [ ]

PRA Conclusions

- PRA Activities Are Well Underway for the B&W mPower Reactor in Support of the Design Certification
  - PRA Activities Being Performed Using Current PRA Standards and Regulatory Guidance
  - PRA Is Being Effectively Used in the Design Development Process to Reduce Risk and Improve Operating Reliability, with PRA Staff Actively Involved with Key Design Decisions
- B&W mPower Reactor Unique Design Features Will Ensure an Acceptably Low Risk to the Public
  - Extensive Use of Passive Systems Design Is a Key Feature
  - Taking a Proactive Approach to Addressing any Phenomenological Issues that Could Impact Passive System Performance

Conclusion and Closing Statements