U.S.NRC

United States Nuclear Regulatory Commission

Protecting People and the Environment

Briefing on Small Modular Reactors

Bill Borchardt
Executive Director for Operations
March 29, 2011

Agenda

- **Overview – Michael Johnson**
- **Advanced Reactor Program – Michael Mayfield**
- **Small Modular Reactor Licensing Activities – Stewart Magruder**
- **Resolution of Key Technical and Policy Issues – William Reckley**

Advanced Reactor Program

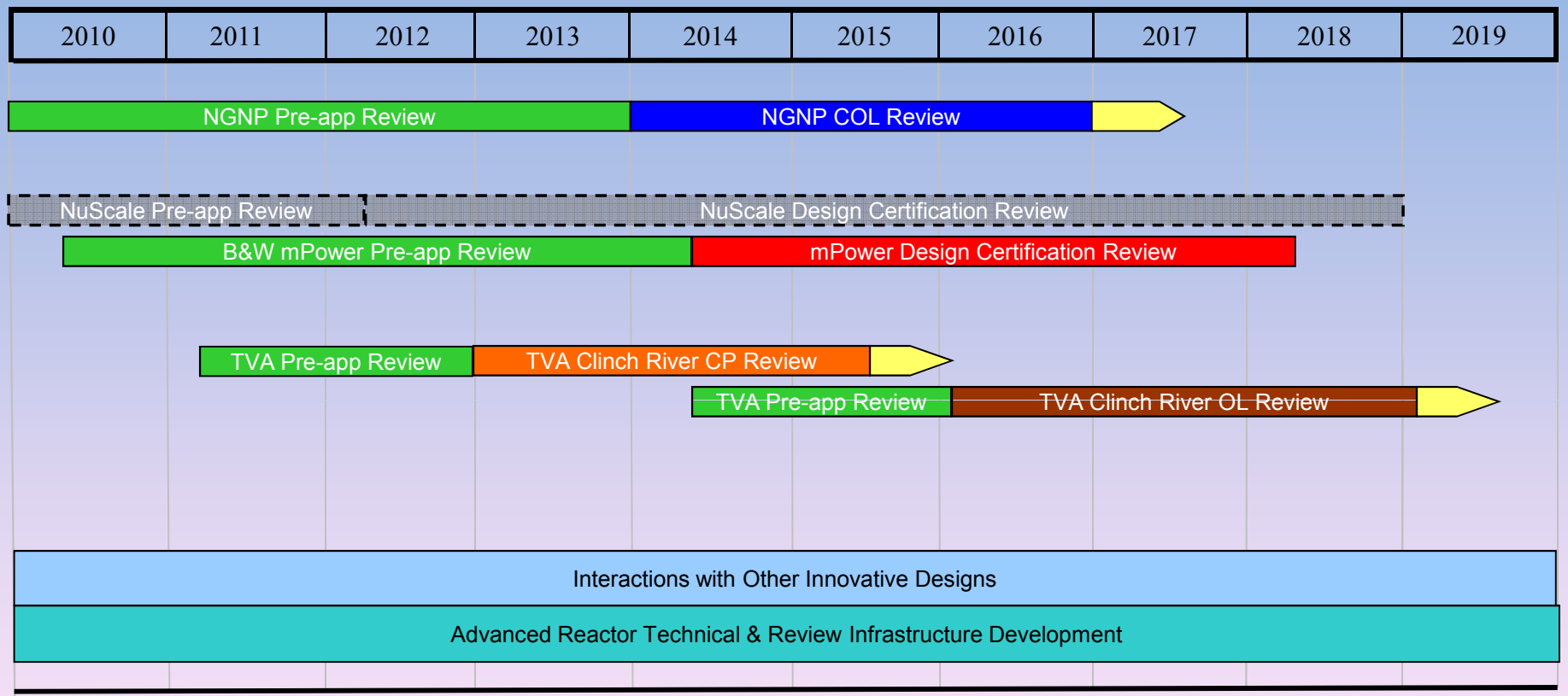
Michael Mayfield, Director
Advanced Reactor Program
Office of New Reactors

Introduction

- **The ARP continues to mature**
- **Making progress on developing infrastructure and resolving issues**
- **Emphasizing preparation for the review of small light-water reactors**
- **Moving forward with preparations for NGNP**
- **Maintaining knowledge base of fast reactor designs**

Potential Small Modular Reactor Licensing Applications

An estimated schedule by Fiscal Year (October through September)



Legend:

Operating License | Design Certification | Construction Permit | Other SMR Activities | Hearing

Pre-application Review | Licensing (COLA/ESP) | R&D/Infrastructure Development

NOTE: Schedules depicted for future activities represent nominal assumed review durations based on submittal time frames in letters responding to RIS 2010-03 from prospective applicants. Actual schedules will be determined when applications are docketed.

Small Modular Reactor Licensing Activities

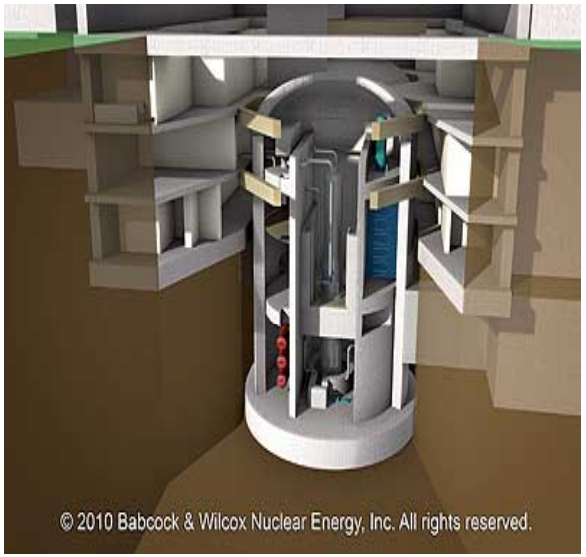
Stewart Magruder, Chief
Advanced Reactors Branch 2
Office of New Reactors

iPWR Pre-Application Activities

NuScale

- Human Factors
- Safety Analyses
- QA Program

mPower



-Design Overview
-Safety Analyses
-QA Program

TVA Clinch River Proposal

- **Proposal requires:**
  - **Coordination of 10 CFR Part 50 and 10 CFR Part 52 reviews**
  - **Update of 10 CFR Part 50 infrastructure and NRC inspection programs**
  - **Discussions with TVA about approach to Part 50 application**

Risk-Informed Review Guidance

- **Discussed in SECY-11-0024**
- **Risk-insights enhance safety focus of SMR reviews**
- **Near-term focus on iPWR reviews**
- **Longer-term development of new framework**

iPWR Review Framework

- **Risk-Informed and Integrated Review**
  - **Considers both safety importance and risk significance**
  - **Graded approach**
  - **Integrates performance-based program requirements**

Implementation Example

- **Station Service Water System Nonsafety-related ; risk significant**

Acceptance criterion	Current Review	Risk-Informed Review
GDC 2 – protection against natural phenomena	Technical analysis and evaluation	Technical analysis and evaluation
GDC 4 – environmental and dynamic effects	Technical analysis and evaluation	Technical analysis and evaluation
GDC 45 - inspection	Technical analysis and evaluation	Programmatic requirements (initial plant testing, ITAAC)
GDC 46 - testing	Technical analysis and evaluation	Programmatic requirements (reliability assurance program, ITAAC)

Resolution of Key Technical and Policy Issues

William Reckley, Chief
Advanced Reactors Branch 1
Office of New Reactors

Resolved Issues

- **NRC Annual Fees**
  - **Memorandum dated February 7, 2011**
- **Prototype Licensing**
- **Operational Programs**
- **Decommissioning Funding**
- **Multi-Module Licensing**

Issues Being Evaluated

- Risk Informed Licensing
- Mechanistic Source Term
- Liability & Property Insurance
  - NEI Paper
- Manufacturing Licenses
  - RIS, ANPR
- Staffing, Security, Emergency Planning

Control Room Staffing

- **Approach**
  - **Task Analyses (NUREG 0711)**
  - **Assessing staffing-related exemptions (NUREG 1791)**
  - **Related Issues**
    - **Plant Design, Event Analyses and Simulation**
    - **Overall Plant Staffing**
  - **Additional description expected to Commission in 3rd Quarter FY2011**
  - **Resolve policy issues in FY12**

Security

- **Approach**
  - **Interacting with designers - security assessments for preliminary designs**
    - **Opportunity for “security by design”**
  - **Performing Issue Identification and Ranking Assessment**

Security

- **Approach (continued)**
  - **Additional descriptions expected to Commission in early FY2012**
  - **Resolve policy issues, if any, for near-term SMRs in FY2012**
  - **Develop longer term plan for some reactor concepts**

Emergency Planning

- **Approach**
  - **Exploring alternatives for SMRs**
  - **Key consideration is public dose in relation to PAG values resulting from severe accident**
  - **Related Issues**
    - **Offsite Dose Consequence Analysis**
    - **Process Heat Applications (NGNP)**

Emergency Planning

- **Approach (continued)**
  - **More detailed description in upcoming Commission paper**
  - **Resolve policy issue in FY2012**

Summary of Policy Issues and Near-Term SECY Dates

SECY PAPER	DATE TO THE COMMISSION
Annual Fees	Memorandum dated 02/07/2011
Risk-Informed Licensing	02/18/2011 (SECY-11-0024)
Multi-Module Facilities	Early Q3 FY 2011
Decommissioning Funding	Early Q3 FY 2011
Emergency Planning	Mid Q3 FY 2011
Control Room Staffing	Late Q3 FY 2011
Mechanistic Source Term	Q4 FY 2011
Physical Security	Q1 FY 2012
Insurance	TBD following assessment
Manufacturing Licenses	TBD following assessment

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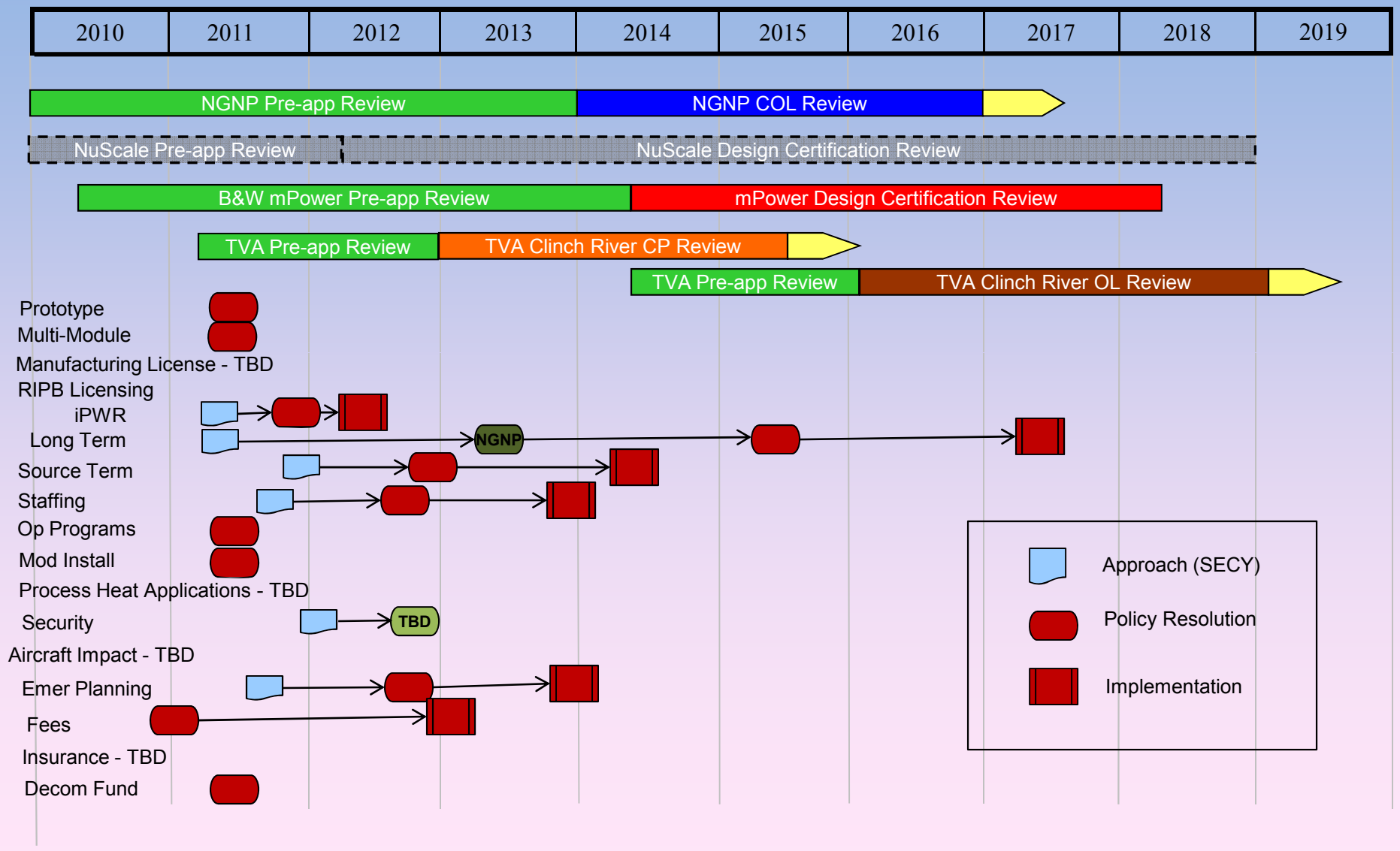
An estimated schedule by Fiscal Year (October through September)



Other Activities

- **NGNP**
  - **White Paper Reviews**
  - **Technical issues & coordinating research activities**
- **International Interactions**
- **Fast reactors & other technologies**
- **Developing procedures and review plans**

Summary

- **Focus on developing the regulatory framework to support near term iPWR applications and the NGNP (e.g. policy issue resolutions, guidance development).**
- **Continue to engage potential applicants in meaningful pre-application interactions**
- **Continue to engage stakeholders on SMR activities**

Acronym List

- **ANPR – Advanced Notice of Proposed Rulemaking**
- **ARP - Advanced Reactor Program**
- **B&W – Babcock & Wilcox**
- **CFR – Code of Federal Regulations**
- **COL – combined license**
- **COLA – combined license application**

Acronym List (Cont'd)

- CP – construction permit
- DARPA – Defence Advanced Research Projects Agency
- DOE – Department of Energy
- ESP – early site permit
- FY – Fiscal Year
- GDC – General Design Criteria
- IAEA – International Atomic Energy Agency

Acronym List (Cont'd)

- **iPWR – Integral Pressurized Water Reactor**
- **ITAAC – Inspections, Tests, Analyses and Acceptance Criteria**
- **NEI – Nuclear Energy Institute**
- **NGNP – Next Generation Nuclear Plant**
- **NRC – Nuclear Regulatory Commission**

Acronym List (Cont'd)

- **OL – Operating License**
- **PAG – Protective Action Guidelines**
- **PRA – Probabilistic Risk Assessment**
- **PWR – Pressurized Water Reactor**
- **QA – Quality Assurance**
- **R&D – Research & Development**

Acronym List (Cont'd)

- **RIPB – Risk-Informed, Performance-Based**
- **RIS – Regulatory Issue Summary**
- **SMR – Small Modular Reactor**
- **SRP - Standard Review Plan**
- **SRM – Staff Requirements Memorandum**

Acronym List (Cont'd)

- **TBD – To Be Determined**
- **TVA – Tennessee Valley Authority**