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# Expectations for Pebble Bed Modular Reactor Preapplication Activities

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# Background

- **NRC's overall expectations for preapplication interactions with Exelon and the Department of Energy (DOE) on the Pebble Bed Modular Reactor (PBMR) were defined in SECY-01-0070:**
  - **identify key safety and licensing issues**
  - **identify a path for their resolution**
  - **seek Commission guidance on policy issues**
- **Document results in letters and Commission papers.**
- **Safety evaluation report on design was not envisioned.**

# **Presentation Objectives**

- **To define NRC expectations for the scope and outcome of preapplication interactions with Exelon and DOE on PBMR technical issues as envisioned in SECY-01-0070.**
- **To seek feedback from Exelon and DOE.**
- **To reach a common understanding of the technical issues, information needs, and end products to be addressed in the PBMR preapplication interactions.**

# **Overview of Key Technical Issues Which Should be Addressed During Preapplication**

- **PMBR design basis:**
  - **events to be considered in the design and the basis for their selection**
  - **acceptance criteria**
  - **role and use of probabilistic risk assessment**
  - **safety classification of structure, system and components and its basis**
  - **what pedigree is implied by a “safety grade” classification?**
  - **role of the operator**
- **PBMR source term for safety analysis:**
  - **quantity, timing, chemical form, transport**
  - **basis, including any planned experimental work**
  - **graphite contribution**

## **Key Technical Issues (Cont.)**

- **PBMR Fuel:**
  - **design goals for performance**
  - **plan for qualifying PBMR production fuel**
    - ▶ **irradiation testing (e.g., test objectives, test conditions, quantity of fuel to be tested, acceptance criteria, etc.)**
    - ▶ **post irradiation examination**
    - ▶ **documentation**
  - **plans for ensuring fuel quality over the life of the plant**
  - **plans for fuel disposal**

# Key Technical Issues (Cont.)

- **PBMR Materials:**
  - plans for graphite manufacture and determining its properties as a function of time, temperature, and irradiation
  - types of metals, service conditions, and design codes to be used for RPV and primary system piping
  - building design (conditions, codes and standards)
  
- **PBMR Safety Analysis:**
  - how will analytical tools be validated?
    - ▶ normal operation
    - ▶ accident analysis (e.g., decay heat removal)
  - role of South African demonstration plant in validation:
    - ▶ what tests?
    - ▶ what instrumentation?
    - ▶ what acceptance criteria?
    - ▶ what documentation?
    - ▶ when will tests be done?

## **Key Technical Issues (Cont.)**

- **Containment vs. Confinement.**
  - **basis for PBMR proposal:**
    - ▶ **plant response to accidents, including offsite doses**
    - ▶ **advantages/disadvantages of containment vs. confinement**
    - ▶ **selection criteria (e.g., dose, defense-in-depth, etc.)**
  - **impact on offsite response**

# Follow Up Actions

- **To address each of these issues on the schedule envisioned will require information to be submitted in writing for our review by December 2001.**
- **Feedback to be requested from Exelon/DOE on whether or not such information can be provided and by when.**
- **NRC to document this request in a letter.**