

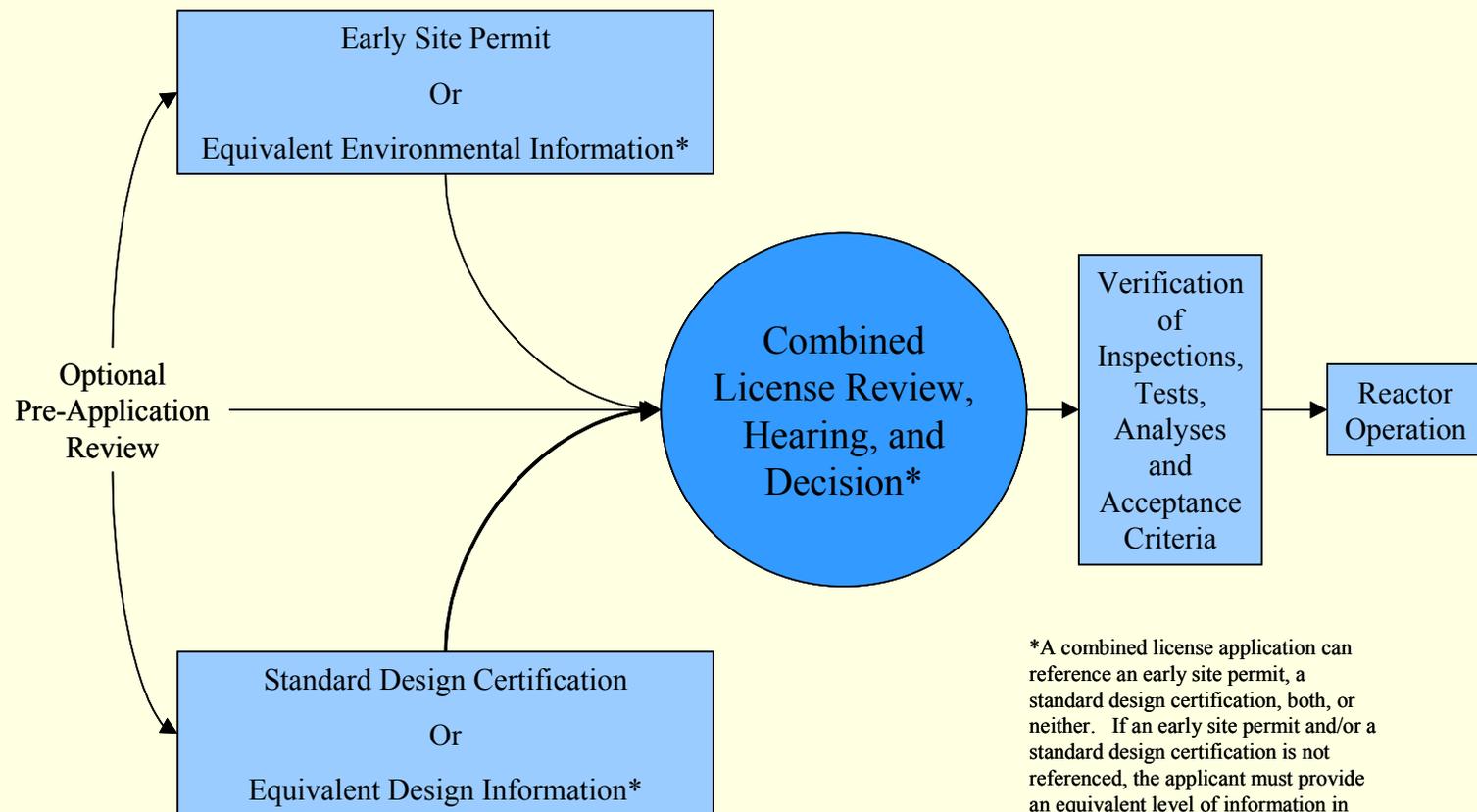
---

# The Nuclear Power Reactor Design Certification Process in the U.S.

James E. Lyons, Program Director  
New, Research, and Test Reactors  
U.S. Nuclear Regulatory Commission



# 10 CFR Part 52 Licensing Process (Future)



\*A combined license application can reference an early site permit, a standard design certification, both, or neither. If an early site permit and/or a standard design certification is not referenced, the applicant must provide an equivalent level of information in the combined license application

# Goals for Part 52 Process

---

- Stable and predictable licensing process
- Resolve safety and environmental issues before authorizing construction
- Reduce financial risks to licensees (COL)
- Enhance safety and reliability through standardization of nuclear plant designs

# Certified Designs

---

- **Review of an essentially complete design**  
(equivalent to Final Safety Analysis Report)
- **Final Design Approval documents the technical acceptance of the design**
- **Design is certified through a rulemaking**
- **Three designs currently certified by the NRC**
  - ABWR
  - System 80+
  - AP600

# Severe Accident Policy Statement

---

- NRC Regulations (including TMI requirements)
- Unresolved Safety Issues
- Medium & High Priority Generic Safety Issues
- Severe Accidents
  - Probabilistic Risk Assessment
  - Insights from severe accident research
- Defense- in- Depth Philosophy
- Balance Prevention and Mitigation

# Advanced Reactor Policy Statement

---

- **Same Degree of Protection as Current LWRs**
- **Enhanced Margins to Safety**  
**and/or**
- **Simplified, Inherent, Passive or Other Innovative Design Features**
- **Proof of Performance of New Design Features**

# Advanced Light Water Reactor Issues

---

- Designs to employ passive safety systems
  - Testing
  - Thermal-hydraulic codes
  - Treatment of uncertainty
- Regulatory Treatment of Non-Safety Systems
  - Treatment of systems that are not safety-related, but are important to risk and/or defense-in-depth
- Design-Specific Probabilistic Risk Assessment (PRA) required

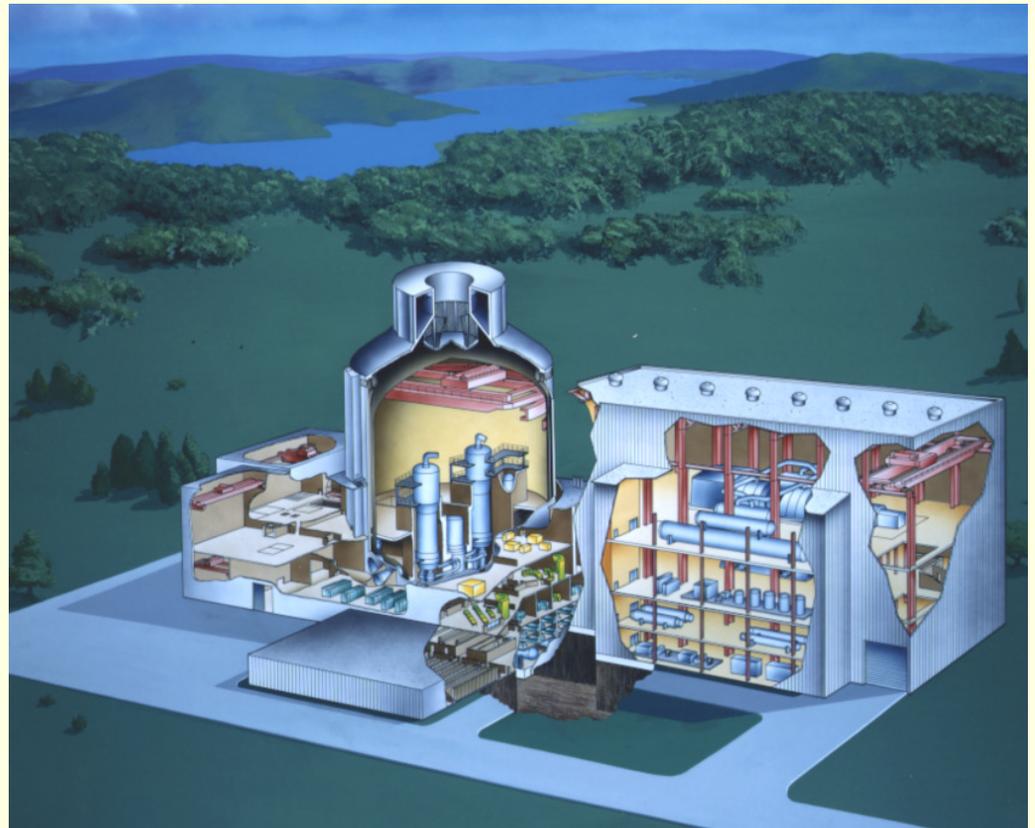
# Design Certification Activities

---

- One design application currently under review
  - AP1000
- Six designs in pre-application phase
  - ESBWR
  - Advanced CANDU Reactor (ACR-700)
  - SWR-1000
  - Gas Turbine Modular Helium Reactor (GT-MHR)
  - International Reactor Innovative and Secure (IRIS)
  - Pebble Bed Modular Reactor (PBMR)

# AP600/AP1000

- **AP600 – 600 MWe**
- **AP1000 – 1117 MWe**
- **Passive Safety Systems**
- **AP600 Certified**
  - AP600 FSER and FDA September 1998
  - DC rulemaking in December 1999
- **AP1000 review in progress**
  - FSER and FDA September 2004



# AP600 TESTING

---

- **Separate Effects Testing**
  - Core Makeup Tanks
  - Automatic Depressurization System
  - Passive Residual Heat Removal System
- **Integral Testing**
  - APEX - Oregon State University
  - SPES- 2 – SIET
  - ROSA/LSTF (NRC) - JAERI

# AP1000 Summary

---

- Review well underway and on schedule
  - Draft Safety Evaluation Report – June 2003
  - Final Safety Evaluation Report – September 2004
  - Final Design Approval – September 2004
  - Design Certification Rulemaking – December 2005
- Currently within budget estimates
  - 30 person-years
  - \$1.5 Million contract assistance

# Summary

---

- Design Certification reviews resolve safety issues before a plant is ordered
- ALWRs expected to be safer than current LWRs
- AP1000 Final Design Approval scheduled for September 2004