



Licensing the Next Generation of Nuclear Plants

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New Reactors

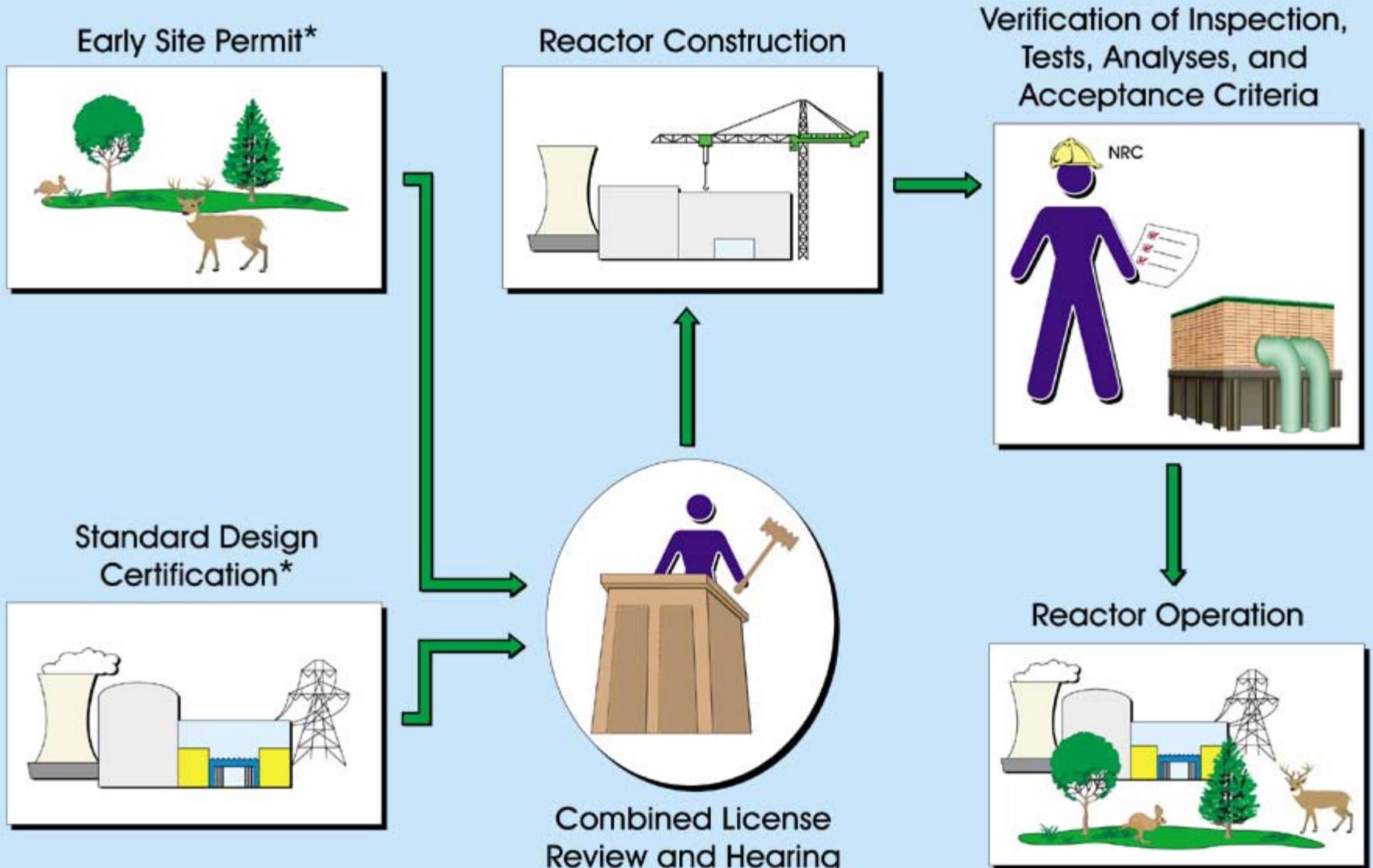
Division of Regulatory Improvement Programs
U.S. Nuclear Regulatory Commission

Presented at
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Session A2: New Reactor Licensing Issues
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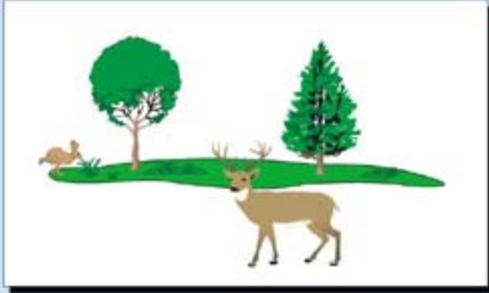
New Construction Prerequisites (from the regulator's perspective)

- Maintain safety of licensed plants
- Enhanced safety for future plants
- Independent and credible regulator
- Meaningful public participation
- Predictable licensing process
- Support national goals related to energy

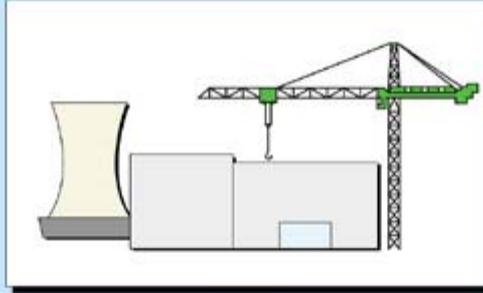
Combined Licenses, Early Site Permits, and Standard Design Certifications



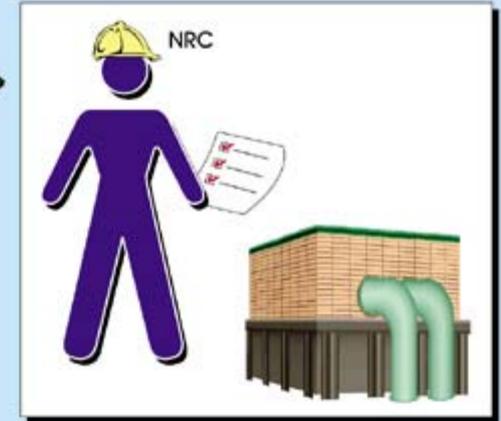
Early Site Permit*



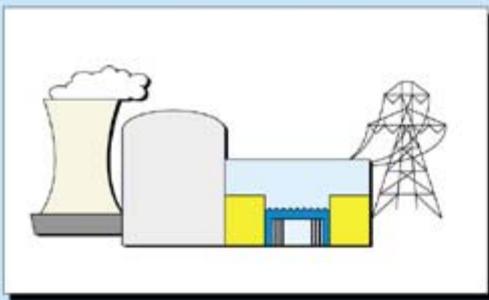
Reactor Construction



Verification of Inspection,
Tests, Analyses, and
Acceptance Criteria

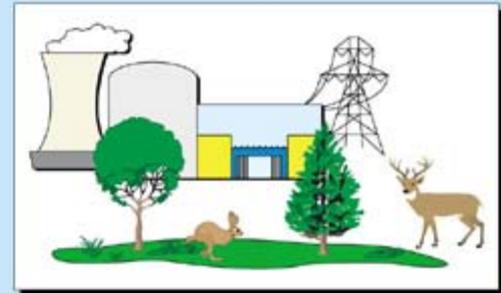


Standard Design
Certification*



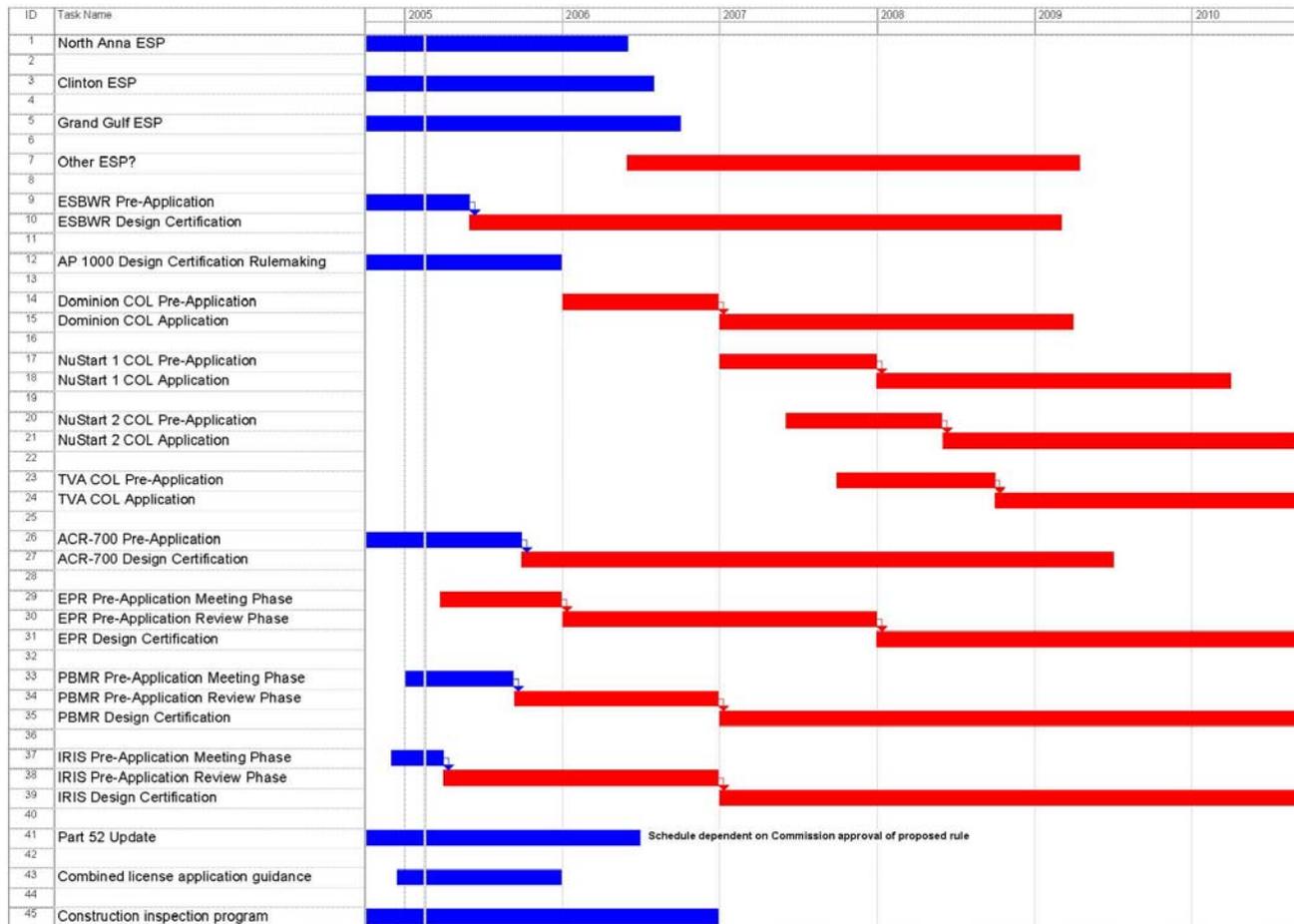
Combined License
Review and Hearing

Reactor Operation



* or equivalent process

Current and Upcoming New Reactor Licensing Activities

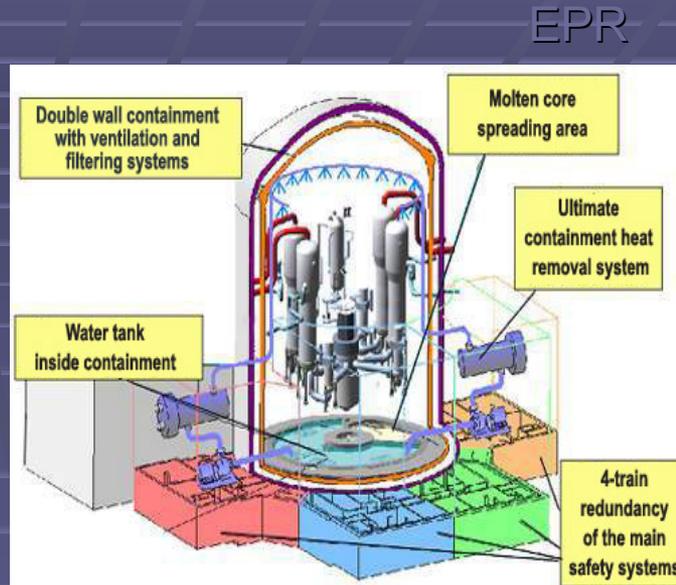
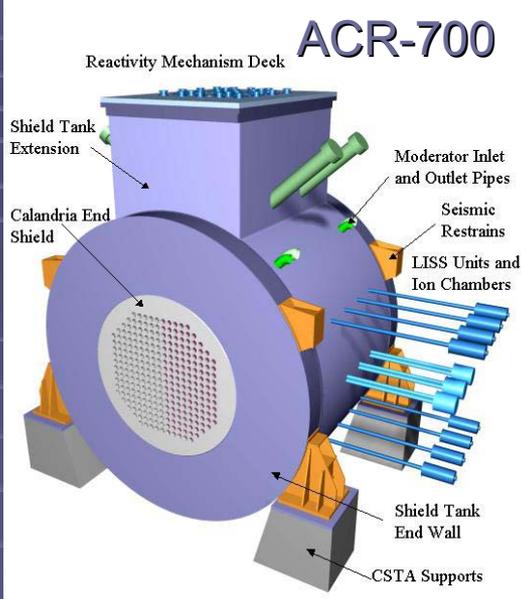
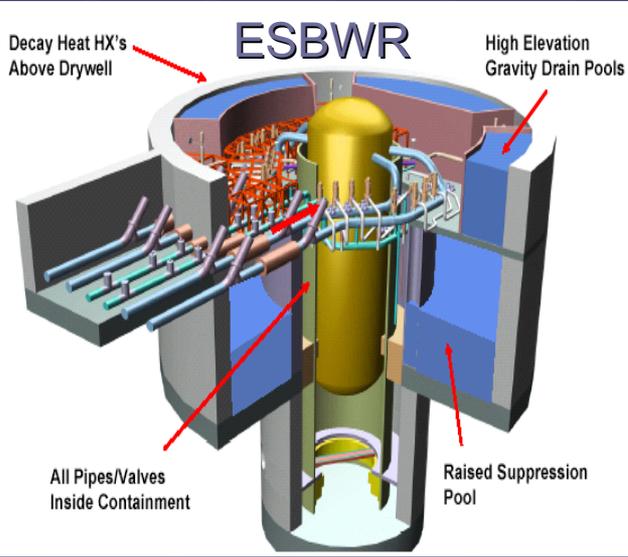


Blue: current activities
Red: upcoming activities

Design Certifications

- NRC review and approval of a standardized design by rulemaking
- Already certified:
 - C-E System 80+
 - General Electric Advanced Boiling Water Reactor (ABWR)
 - Westinghouse AP600
- Certification Rulemaking in progress:
 - Westinghouse AP1000-FSER/FDA Completed September 2004
- Likely near-term certification reviews:
 - General Electric Economic and Simplified Boiling Water Reactor (ESBWR)

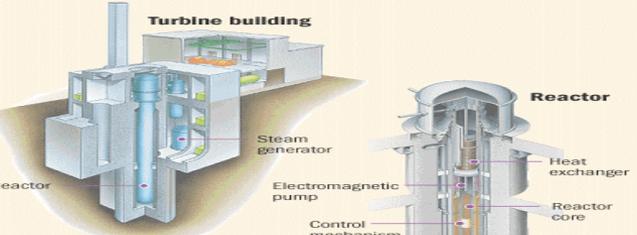
Current and Potential Pre-application Reviews



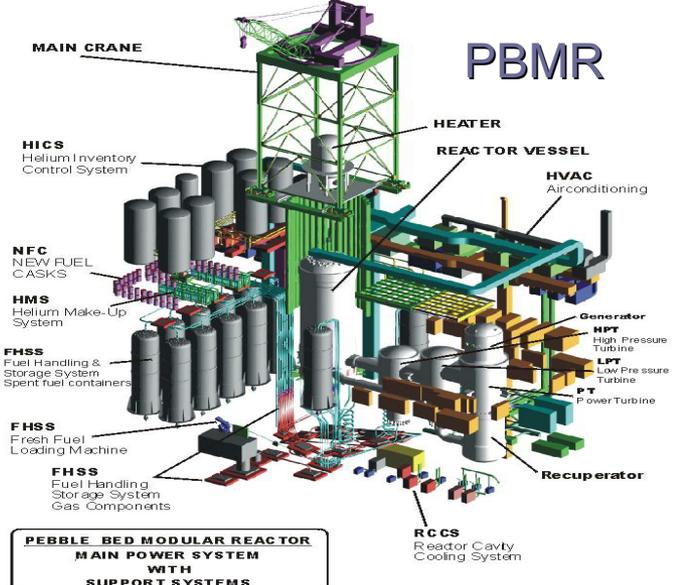
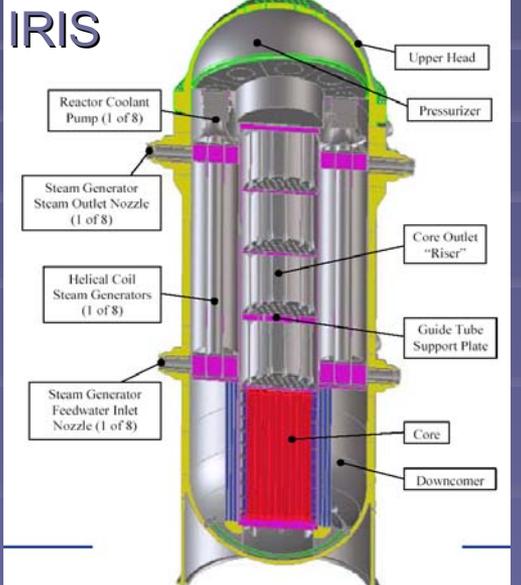
Toshiba 4S

Nuclear power for rural villages

Toshiba is proposing a small modular nuclear reactor to supply power for Galena, a Yukon River town of 713. It has yet to be constructed, but would likely consist of a 70-foot tube with a garbage-can-sized uranium core at the bottom and a liquid metal heat exchanger in the upper section. The assembly would be buried in a concrete silo. The slow-burning uranium would last 30 years, powering steam turbines to create electricity. Conceptual drawings of the plant are below.



- Reactor specs**
- **HEIGHT:** About 70 feet
 - **WEIGHT:** About 60 tons
 - **ELECTRICAL PRODUCTION:** About 10 megawatts. A typical lower 4S nuclear plant is 1,000 megawatts or more. When the fuel is spent, the core can be removed and recycled.
 - **ELECTRICAL COST:** The plant could generate electricity at 10 cents a kilowatt hour, which is slightly more than in Anchorage or Fairbanks, but a half to two-thirds the current cost in Galena.
 - **CONSTRUCTION:** The modular plant is constructed in a factory and could be delivered by barge to the site. Components are small enough to be delivered by truck or helicopter.
 - **PROJECT COST:** \$20 million. Toshiba says it will install the Galena reactor free, as a demonstration project.
 - **NUMBER OF EMPLOYEES:** The reactor has no operator or maintenance personnel; the steam generator would probably require the same number of people as the diesel-powered plants.
- Source: Toshiba



ESP

- Allows early resolution of siting issues and ‘banking’ of a site for 10-20 years
- Review Areas
 - Site Safety
 - Emergency Preparedness
 - Environmental Protection
- Applications Received
 - September 2003 – Dominion (North Anna)
 - September 2003 – Exelon (Clinton)
 - October 2003- Entergy (Grand Gulf)

COL

- Combined construction permit and conditional operating license for a nuclear power plant
- May reference an ESP, a standard design certification, both, or neither
- Objective is to resolve all safety & environmental issues before authorizing construction
- Prior to fuel load, must verify the facility has been constructed in accordance with COL (CIP-ITAAC)
- COL is the fundamental licensing process in Part 52 for reducing regulatory risk for companies building nuclear power plants

COL Resources and Critical Skills Challenges

- Get realistic, and accurate information from the industry on plans for submitting applications
- The NRC staff plans to stagger the reviews to make the most efficient use of experienced resource teams
- Clear expectations on schedules/responsibilities (internal and external)

COL Challenges of the Part 52 Process

- Both DC and ESP applications/FSEs have COL items that need to be addressed during the COL review. Original Part 52 vision did not anticipate a large number of COL items that would need to be resolved.
 - For AP1000 there are 240 COL action items that need to be addressed in the COL application
 - ESPs applications contain additional follow-up at COL stage via items such as plant parameter envelope

NRC Preparations for a Combined License Application

- Current Activities
 - NEI COL Application Guidance-Review in Progress
 - 10 CFR Part 52 Proposed Rule
 - Construction Inspection Program
 - COL Program Review- (Programmatic information needed at COL-In progress)
 - Emergency Planning (EP) ITAAC

Construction Inspection Program - NRC Challenges -

- More aggressive construction schedules
 - Possible fabrication before COL issued
 - Modular construction – multiple locations
- Verifying successful completion of ITAAC
 - Unique to Part 52 licensing

Summary

- Stable and predictable licensing process
- 3 reactor designs have been certified
- AP1000 in design certification phase
- 6 designs in pre-application phase
- 3 ESP applications received in late 2003
- Modernizing regulatory infrastructure to address advanced reactors
- Planning for possible COL application in late 2006/2007
- For more information, visit our website:
<http://www.nrc.gov/reactors/new-reactor-licensing.html>