

Overview of the Role of Nuclear Regulatory Research in New Reactor Licensing



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RES Mission

- Support licensing, inspection, and rulemaking activities
- Prepare for future challenges
- Maintain center of technical expertise
- Provide technical analyses

RES Role in New Plant Licensing

- RES supports NRR's pre-application and design certification reviews of advanced light water reactor designs (e.g., AP-1000, ESBWR, ACR-700)
- RES leads NRC's pre-application reviews of new non-light water reactors (e.g., PBMR, 4S)
- RES leads the development of NRC's longer range infrastructure needs for licensing new plant designs, technologies and safety review framework
- RES would support NRR in reviewing a COL application, as needed

Scope of NRC Research

- Applicants develop the methods, tools, and data to demonstrate the safety of proposed reactor designs and technologies
- RES conducts research to develop NRC audit capability to assess applicants' submittals
 - Development and maintenance of computer codes and models
 - Development of experimental data to validate codes and models
 - Forward-looking research related to new or evolving technologies

Pre-application Review Objectives

- Familiarize NRC with the design and technology
- Provide feedback to pre-applicant on the key design, technology and licensing issues
- Provide feedback to pre-applicant on their technology development program plans
- Provide input to NRC infrastructure development needs and plans

Potential Feedback and Infrastructure Development Areas

- Reactor and plant analysis codes
- Fuel performance analysis and qualification
- Materials performance analysis and qualification
- Structural design requirements
- Operational performance monitoring, inspection, testing
- Event selection, safety equipment classification
- Probabalistic risk assessment
- Licensing policy issues

RES Support in the Design Certification Review

- Assist in safety analysis code reviews
- Conduct confirmatory safety analyses
- Perform confirmatory testing
- Perform PRA studies
- Evaluate safety margins and uncertainties
- Provide input to safety evaluation report

EXAMPLE: RES Support to AP1000 Design Certification Review

- RES provided technical support to NRR on thermal hydraulics and severe accidents.
- RES performed audit calculations using TRACE and MELCOR codes to evaluate AP1000 performance during design basis and beyond design basis accidents.
- RES addressed issues related to:
 - Vessel Inventory and Passive Safety System Performance
 - Evaluation of Liquid Entrainment Processes
 - Containment Integrity Due to Localized Hot Spots

Example: RES Support to ESBWR Design Certification Review

- RES has coordinated with NRR to develop and implement an integrated research plan to directly support the certification of the ESBWR design.

- The objectives of the research program are to:
 - Provide audit tools and analyses to support the staff's review of the ESBWR design certification application; and
 - Provide test data to support and assess the tools and enhance physical understanding of the important phenomena and processes.

- Areas of RES support:
 - Thermal hydraulics
 - Severe accidents
 - PRA
 - Materials