

New Reactor Construction Lessons Learned

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Key Insights

- The importance of supply chain/vendor quality and oversight
- Achieving early alignment on seldom used consensus standards
- Improved regulatory approach for initial licensing of operators and other regulatory program areas
- Balancing level of detail and change control for 10 CFR Part 52 applications to ensure both safety and reasonable flexibility

Supply Chain and Vendor Performance

- Licensee identified some discrepancies for Safety Related items after receipt or at vendor facilities
 - Volume of primary system component
 - Fabrication details of civil engineering “modules”
- NRC identified some discrepancies – “modules”, rebar bend radius
- NRC investigation concluded Nuclear Safety Culture concern at “module” fabrication facility



Lifting over 1,200 tons, the heavy lift derrick places the CA01 module inside the Vogtle Unit 3 containment vessel.

Supply Chain and Vendor Lessons

- Importance of prior experience working under stringent QA requirements (whether Nuclear Safety Related or other)
- Importance of having design details and fabrication drawings fully finalized prior to commencement of fabrication
- Need for effective interface between NRC construction inspection and vendor inspection programs and staff.

Consensus Standard for Nuclear Concrete

- American Concrete Institute (ACI), Code Requirements for Nuclear Safety Related Structures, ACI-349-01
 - NRC staff/Industry disagreement over detail for anchoring walls to basemat
 - Departure from “typical” detail in design control document
 - Violation resulted in construction delay
- American Concrete Institute (ACI), Building Code Requirements for Structural Concrete and Commentary, ACI-318-19
 - Includes provisions not yet adopted into ACI-349
 - Industry and staff found its use acceptable for specific issues in subsequent license amendments

ACI Lessons

- Designers should push for Consensus Standards to be as current and unambiguous as possible.
- Fabricators/constructors should be judicious in departing from representations in the design control document/safety analysis report
- Licensees should monitor for differences between their safety analysis report and fabrication/construction drawings and push for communication with the regulator prior to the start of construction

10 CFR Part 55 Operator Licensing

- Historically, NRC oversaw “cold” licensing – no plant to gain experience on or computer-based simulators to operate
- Current regulation reflect a mature industry
 - “Simulators” that reflect the current plant
 - Practical exams that take place in the plant
- Extensive work between NRC and industry to plan for new construction operator licensing
- NRC late-identified concerns impacted operator-trainees and licensee
 - Acceptable “simulators”
 - Delays in construction impacting NRC guidance on timing of exams

Operator Licensing Lessons

- Issues resolved at Vogtle 3 & 4 through NRC approval of alternative simulator and departure from “guidance” on timing of licensing exams
- Rulemaking underway to fix 10 CFR Part 55 to recognize new construction
- Timing of licensing under Part 55 interesting logistical challenge/opportunity for vendors/licensees/operators
- Similar challenges/opportunities in other program areas: Emergency Planning, Security, Transportation, Fuel Cycle, etc.

Balancing Licensing Detail and Flexibility

- Existing reactors licensed to 10 CFR Part 50
 - Construction Permit w/ limited detail
 - Operating License after construction completed
 - Allows flexibility during construction
 - Advisory Committee review, Hearings, and Court challenges based on as plant as constructed
- New reactors to date licensed under 10 CFR Part 52
 - Design Certification of a reactor is done as Rule Making
 - Opportunity for Public comment at this stage
 - Finality for certified design
 - Combined License prior to construction

Resultant Challenge

- Providing sufficient information and detail prior to construction
 - Support development of the Safety Evaluation Report by NRC staff
 - Support independent assessment by the Advisory Committee on Reactor Safeguards
 - Support right for public meaningful participation in Rulemaking/Hearing/Court
- Allowing reasonable flexibility to deal with changes in supply chain, siting conditions, and the evolution of technology
- Key – Basis for confidence that reasonable flexibility doesn't undercut the findings of Reasonable Assurance of Adequate Protection

Prior to Gaining Construction Experience

- Design Certification Control Documents get increasingly large
- The amount of information in the designs that required prior NRC approval to change grew
- In consequence, the cost to both the applicant and the NRC staff to do the reviews continued to grow, as did the duration of reviews to some extent

Construction Experience

- Details and lack of flexibility drove licensees to have to submit and NRC staff to review and approve numerous license amendments that were not safety significant
- NRC team went back to find the underlying causes of the increase in detail and rigid control
 - Standard Review Plan (NUREG 0800) requirement in Part 52
 - Inadequate understanding of all administrative tools, integrated safety from test programs, and lack of training in “Reasonable Assurance” fundamentals
- NRC and Vendors engaged more effectively on alternative ways to achieve appropriate control without forgoing reasonable flexibility

Actions to Rebalance

- Guidance to staff on licensing New Reactors. [Memo to New Reactor Business Line from F. Brown, NRO re: Expectations for New Reactor Reviews. \(nrc.gov\)](#)
- New approach to content of Design Certification documents. [SECY-19-0034: Improving Design Certification Content \(nrc.gov\)](#)
- Rule Making to align licensing regulations to address lessons described here, and others. [2021-01860.pdf \(govinfo.gov\)](#)
- Rule Making for non-light water reactor licensing approach (10 CFR Part 53)

Thank You!

Questions?