Design and Construction Considerations in Conceptual Design of Advanced Reactors

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Background

• The world-wide demand for advanced nuclear reactor technology is steadily increasing

• A key factor to advanced reactors success will be in reducing construction costs and schedule

• Reactor vendors make early decisions of commercial viability based on conceptual design assumptions

• These early decisions commonly ‘set’ building layout and design moving forward

• Informed conceptual design decisions are important for ensuring success of advanced reactor projects
Conceptual Design Process (Civil/Structural Perspective)

• Process is typically brief and informs cost and schedule projections

• Significant unknowns (site properties, construction methods, design codes and standards)

• Conceptual Design Process:
  – Interfaces with systems and components groups
  – Layout process is iterative
  – Safety classification assumptions
  – Constructability and licensing considerations
  – Cost considerations (need for improved tools)

• Refinements on basic layout
Civil/Structural Decisions

- Embedment and method of excavation (seismic analysis considerations)

- Accessibility
  - Compact design may have inefficiencies
  - Access for efficient movement of craft and materials

- Base Isolation and Equipment Skids

- Aircraft Impact Considerations
  - Can significantly affect layout
  - Relaxed requirements for compact designs?

- Seismic Interactions
  - NEI LMP (risk-informed design)
  - Building Collapse Evaluation (limited guidance)

AP1000® Layout
Civil/Structural Decisions (Cont’d)

- Modular Construction
  - System decision (SC, Pre-cast concrete, etc.)
  - Basemat anchorage
  - Exterior foundation walls (exposure to soil/moisture)
  - Floors/roofs
  - Transportation limitations
  - On-site fabrication/assembly requirements
  - Fit-up and tolerances

- Field Routing (minimize)

- Trades/Craft (training)
  - Qualify through practicum testing (anchorage/connections/etc.)
Summary

• Informed conceptual design decisions are key factors in successful advanced reactor projects

• Constructability, modularization, accessibility, and improved cost tools are key factors to reducing construction costs and schedule

• These early decisions commonly ‘set’ the design moving forward

• Improved construction cost estimating tools will help significantly
Thank You