Construction Codes and Standards: Avoidance of Delays for New Nuclear Power Plants

Interim Report on a Project Sponsored by the U.S. DOE Office of Nuclear Energy

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July 9, 2008

ENERGETICS

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Interests of DOE/NE

- Committed to development of safe, sustainable, and environmentally responsible nuclear power plants
- Ensure barriers to nuclear plant construction are addressed and deployment occurs with minimal delays
- Participate in coordinated efforts with SDOs, industry, NRC to assure consensus on construction standards

Project Objectives

- Identify construction codes and standards on which government and industry intend to rely
- Determine if those codes and standards are current
- Identify areas where differences may exist as to which codes and standards apply
- Encourage resolution of such differences

Limitations of This Review

- Did not include all codes & standards
- Addressed 2 designs and 2 COLAs
- Contacted only 4 out of 60+ SDOs
- Did not address technical adequacy
- Lack of participation by construction contractors

Project Status

- Compiled list of codes and standards
  - NRC (Regulations, Reg Guides, SRP, BTPs, IPs)
  - Westinghouse (AP 1000 DCD)
  - TVA (Bellefonte COLA)
  - General Electric (ESBWR DCD)
  - Dominion (North Anna COLA)
- Discussions with ANS, ASME, ASTM, IEEE
- Potential concerns identified for discussion

List of Codes and Standards

- About a thousand standards; list is about 70 pages long
- Produced by more than 60 SDOs
- 520 referenced by NRC; 220 by W; 565 by GE; a few in COLAs
- Arranged in Excel chart, alphabetically by ID # (title, ID #, edition, subject, where referenced, date referenced, NRC approval, NRC exceptions, comparison of reference locations, remarks)
- Some have been color coded
  - Red = referenced standard withdrawn
  - Yellow = different versions referenced
  - Green = appears to be agreement
  - Lavender = status not determined

General Observations

- Some standards referenced only by NRC
- Some standards referenced only by industry
- Large differences between two DCDs and COLAs
- Differences between standards referenced in NRC licensing guidance and those referenced in DCDs and COLAs should be resolved in the licensing process
- Construction-related standards appear to have significant differences
- Different versions of same standard are referenced within NRC and between NRC and industry

Potential Concerns Identified

- Differences among standards referenced by industry and NRC (especially in inspection procedures)
  - Resolution might not occur until after construction begins
  - Such differences might lead to delay or rework
  - Generic identification and discussion of potential differences could avoid those consequences

Potential Concerns, cont.

- Some standards referenced by NRC or industry do not appear to have been updated (reaffirmed or revised) to assure consensus
- Lessons learned in construction of plants in the 1980s may not be adequately reflected in ASME code and other standards, e.g., structural welding and concrete
- Standards for constructing some advanced equipment applied to new plants are not yet available

Potential Concerns, cont.

- New construction technologies may require new standards, e.g.,
  - N-stamps for modules constructed offsite by several vendors and then assembled onsite
  - Onsite performance testing of modules constructed and tested offsite then mated with associated equipment onsite
  - Qualification of construction workers

Recommendations

- Clarification of NRC rules on applicable revisions of standards (i.e., “standards of record”) not treated in NRC safety evaluations of DCDs and COLAs
- Review and refinement of Excel chart of standards by NRC, SDOs, and industry
- Discussion among SDOs and ANSI of possible improvements to increase assurance that referenced standards are up to date
- Discussions among SDOs, potential builders, NRC and applicants about standards to apply during construction and inspection of construction, thereby engaging persons of wider construction experience