Lessons Learned from Past and Ongoing Construction Projects

CNRA International Workshop on New Reactor Siting, Licensing and Construction Experience

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Presentation Outline

- NRC ConE Program
- ConE Program Successes
- NUREG-1055: History Lesson for the Industry
- NUREG-1055: History Lesson for the NRC
- History Repeats itself
- NRC Initiatives
- Long-term Goals
- Examples from Event Evaluations
- ConE Database
NRC ConE Program

- Focuses on new reactor designs and construction
- Screens both OpE/ConE events for applicability to new reactors design and construction
- Assigns a safety-significance level (SSL) to OpE/ConE events based on the risk of the event causing future operational impact
- Assesses NRC regulatory activities for adequacy or the need for enhancement
- Shares ConE insights internationally via Generic Communications such as Information Notices

ConE: Construction Experience
OpE: Operating Experience
ConE Program Successes

• Updated NRC-INPO MOA to exchange ConE info with industry
• Issued several information notices (INs)
  – IN 2008-17: Construction Experience With Concrete Placement
  – IN 2009-06: Construction Experience with Flood Protection Features
  – IN 2010-01: Pipe Support Anchors Installed Improperly
  – IN 2010-02: Construction Experience with Cables, Connectors, and Junction Boxes
  – IN 2010-08: Lessons Learned with Welding and NDE
  – IN 2010-xx: Construction Experience with HVAC (in process)
• Evaluated 350+ OpE/ConE events
• International Cooperation and Exchange of ConE Information
• Developed a ConE database in SharePoint and a Webpage
• Evaluated “old” LER and IRS reports

INPO: Institute for Nuclear Power Operation
MOA: Memorandum of Agreement
LER: Licensee Event Report
NUREG-1055: History Lesson for the Industry

- Treat regulatory requirements as “minimums” not “maximums”
- Design before construct
- Hire project staff/contractors with previous experience
- Use experienced procurement organizations
- Encourage problem reporting and resolution
- Carefully evaluate bidders before awarding contracts
- Closely monitor contractor performance
- Use QA program as management tool – Upper management should be engaged in QA program

**NUREG-1055:** “Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants: A Report to Congress”
NUREG-1055: History Lesson for the NRC

- Enhance review of licensee experience/qualifications
- Perform detailed audits of licensee QA implementation
- Use contractor support for inspection activities
- Third party audits as a supplement to NRC inspections
- Revise construction inspection program
- Assign (construction) resident inspectors on site earlier
- Improve trending analysis of inspection findings
History Repeats Itself!

Ongoing construction projects show similar deficiencies identified in NUREG-1055, for example;

- Poor communication between design and construction organizations
- Overconfidence in personnel
- Ineffective problem ID, reporting and corrective action
- Unrealistic and aggressive schedules
- Inadequate assignment of responsibilities and authority
- Vendor Issues
- Subcontractor issues
NRC Initiatives

• Development of a new construction inspection and a construction assessment program
• Enhanced vendor inspection program
• Part 52 standardization to address early design issues
• Use of construction resident inspectors
• Use of ITAAC in verifying construction completed per design and license requirements
• Developed a Construction Experience (ConE) program
• Developed a Construction Experience Knowledge Management Center
NRC ConE Program Long-term Goals

- Establish a ConE Organization
- Establish a Clearinghouse for Construction Events
- Launch a Public Version of the ConE Database
- Support NRC Inspectors During Construction Activities
- Improve Communication across the NRC and Globally
- Publish NUREG Documents to Communicate/Maintain Knowledge
- Conduct Periodic Self-assessment
- Expand International Cooperation and Information Exchange
- Support Advanced Reactor Program
NRC ConE Database

- Initially Developed in MS ACCESS in May 2009
- Transitioned and deployed in SharePoint in September 2010
- Web-based functions/search
- Contains “evaluated” ConE/OpE Events
- Links each event to specific SRP Chapters and IPs
- Provides recommendations to enhance NRC licensing or inspection guidance documents
- A valuable tool for NRC inspectors and technical reviewers
- Currently contains over 350 ConE-related events
- A public version of the ConE database is being developed

SRP: Standard Review Plan
IP: Inspection Procedure
Examples From Event Evaluations

Grand Gulf Safety-related SW Pump House Airflow (8/2009)

- With the ventilation fans running, GG measured the airflow significantly lower than expected
- Inspections showed the intake screens had not been inspected or maintained for 20 years
- After cleaning, airflow improved by 50%
- Original operability evaluation did not address impact of external/seismic events on the system under this condition
ConE Insights From the GG Event

• Can be interpreted a “design” deficiency because maintenance and inspection requirements were not specified in the plant design or tech specs
• This event is significant since inoperability of SR ventilation system impacts multiple systems, specifically, during accident conditions
• “Low” discovery potential in the absence of inspection/maintenance requirements
• Numerous past experiences exist
• An information notice is being developed
• Identified specific SRP Chapters, and IMCs and IPs to emphasize surveillance and preventative maintenance
Examples From Event Evaluations

- Nogent-1: Leak in Underground Section of two Trains of ESW
  - Leak discovered on sections of two ESW Trains
  - Pipes are underground and set on bed of concrete at each bend
  - Causes attributed to (1) insufficient clearance between the pipes and the walls of the manholes, and (2) differential subsidence between civil engineering structures
  - Many similar past events, including U.S. plants
  - IN all instances, (common) causes attributed to poor design, poor compaction of backfill before laying the pipes, and poor construction quality
ConE Insights From the Event

- All types of new reactor designs are susceptible
- Low discovery potential affecting multiple systems
- A safety-significant issue due to common-cause failure, programmatic deficiencies, and multiple previous occurrences
- Identified applicable NRC IPs and recommended enhancements regarding inspection of buried piping – e.g., sample inspection of all activities (procurement, installation, backfill, and QA of as-built configuration and associated manholes);
- Evaluating the adequacy of NRC requirements, and Industry initiatives, for design, inspection, and maintenance of buried piping a priority for the NRC, especially, the NRC Chairman