Configuration Management for New Nuclear Plants

ISSUE STATEMENT

Best practices for new nuclear plant deployment dictate that effective programs, processes and procedures be in place to maintain and manage the plant configuration and information. Implicit in this requirement is the necessity to demonstrate that design and license basis requirements are identified and are satisfied in the physical configuration.

New nuclear plant owners will gain significant project cost and schedule advantage by effectively managing and maintaining configuration management (CM) of plant data throughout the life of the plant (design, licensing, construction, startup, operations, maintenance, and decommissioning). This can be best achieved by leveraging existing international information standards, implementing newly developed data interoperability methods and tools, and adopting a modern data management approach with no redundant data.

DRIVERS

Pre-Operational Cost Drivers
- Owners constructing new nuclear plants risk significant cost increases unless the CM-related data turnover from the engineer, procure and construct (EPC) company is defined completely and accurately.
- Loss of plant configuration will put at risk the plant startup cost, schedule and regulatory approval.

Post-Operational Cost Drivers
- Significant costs are likely to occur unless the data turnover from the EPC seamlessly provides needed utility and minimizes restructuring by the plant staff
- Unnecessary cost will be experienced unless the data conforms to global information standards to reduce information ambiguity during the transition to the operational phase of the facility.

Industry Drivers
- The Institute of Nuclear Power Operations (INPO) assesses a utility’s configuration management practices as a measure of the utility’s overall controls and effectiveness. INPO sees configuration management as a core process that supports safe operations, maintenance, supply chain and design control, and expects new plants to have an integrated information repository to manage their configuration. Owners/Operators do not have experience implementing data turnover of this complexity.
- In the United States, configuration management will be critical in complying with the requirements of the Inspection, Testing, Analyses and Acceptance Criteria (ITAAC) process dictated by federal statute. Coordinating multiple inputs from multiple organizations starting early in the construction phase and rigorously maintaining such information through fuel load will be difficult without a methodology and set of controls to ensure the CM program and design basis are clearly established.

RESULTS IMPLEMENTATION

Upon completion of this work:
- The Owner/Operator will have tools available to build the infrastructure necessary to support effective configuration management. The standardized information repository developed through this effort will ensure that data developed and turned over from suppliers and the EPC during the design, procurement, construction, testing and operation phases is easily captured for use in the plant’s overall configuration management for meeting its future needs.
- Software vendors will gain insight into how their engineering design software (2D and 3D models and other modeling technology) can be modified to meet industry needs and comply with industry standards for data models, data interoperability, data quality assurance, and operations and maintenance programs.
PROJECT PLAN

EPRI will work with owners, operators, EPC contractors, nuclear steam supply system vendors, selected equipment suppliers, and engineering design and data retention software suppliers to define what information is required, when is it required, how will it be maintained, and how will it be turned over.

EPRI — Develop configuration management best practices for the next generation of nuclear power plants. Specifically, EPRI will develop a well defined data handover process that utilizes global information standards. This has already started with the first draft of the Handover Guide (1019221) and will be continued with the development of data handover templates for all stages of the handover process. EPRI is currently developing generic data models adhering to global information standards that new nuclear power plant owner/operators can use to define the data turnover requirements from suppliers to the EPC company and from the EPC to the owner/operator. These data models will be developed by updating a previous EPRI project called the Plant Information Network (PIN), published in 1987. The final data model will not only contain all the data elements necessary to operate and maintain a power plant, but will also identify where the data is used (e.g., Maintenance Rule, in-service inspection, equipment reliability programs). Once the data elements are defined, EPRI will develop a quality assurance methodology for graded management of the CM engineering software and data. Finally, EPRI will develop the business rules that define how CM data will be maintained, including the business and relationship rules for all data from the Design Control Document down to the operational data collected on each component.

Owner/Operators and EPCs — In current systems and for procurement of future systems, the owner/operator and EPCs will be able to use the developed and verified information standards, data models and structures, and quality assurance methodologies to improve the procurement process and operational management of the plant’s informational resources.

Equipment Vendors — Equipment vendors will be able to use the developed data interoperability standards in bid, procurement and delivery of major components.

Software Vendors — Software vendors will be able to use the developed guidance to improve and standardize their products for future releases to incorporate data standards and best practices in their CM related software.

RISKS

- Financial and contractual constraints on the leading new power plant construction projects may restrict owner/operator engagement in new methodologies and standards development.
- Lack of coordination among new build owners/operators and lack of agreement on a single standard could make vendor implementation less likely.
- The nuclear industry accounts for a small percentage of the software market. Vendor support for the methodologies and standards development, therefore, may be limited. However, the project is maintaining close contact with the software vendors to ensure that this risk is limited.