DIGITAL KNOWLEDGE TRANSFER FROM THE STAGES OF PLANT DESIGN AND CONSTRUCTION TO THE OPERATION STAGE

Assoc. Prof. Dr. Latchesar Kostov, Chairman
Bulgarian Nuclear Regulatory Agency

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Round Table Session: Life Cycle Management.
From management of NPP construction to the management of information about NPP through the life cycle
Regulators

Outline

- The recent development of digital technologies and common information systems leads to improvement of the communications in all areas of our life and gives the possibility to store large amount of data;
- The transfer of nuclear knowledge is one of the areas where the use of these technologies could facilitate and further improve the effectiveness of interactions between nuclear regulators, operators, design and engineering organizations that are involved in the authorization and life cycle management of nuclear power plants.

Information Management at Design Stage

- From regulatory perspective, the challenges in information management appear first at the stage of review and approval of the plant technical design;
- Initially, there is a need to transfer information on the national regulatory requirements and safety expectations to be addressed in the plant design and safety documentation;
- Further, during the regulatory review and approval of the technical design and safety analysis report, there is a need of extensive exchange of knowledge and technical data.

Information Management at Design Stage

Example of information exchange platform

- A web-based platform was used to transfer information between the BNRA and our consultants (Riskaudit IRSN/GRS International) in the review of the design safety documentation for Belene NPP;
- A SharePoint platform was created to exchange:
  - → Regulatory requirements, safety standards and best international practices to be considered in the review process;
  - → The Intermediate Safety Analysis Report (SAR), comprising more than 8 000 pages, and additional Topical reports;
  - → Site-related information, needed for the review;
  - ← Specific technical questions to be submitted to the Vendor;
  - ← Results of the review and analyses of specific safety issues.

Information Management at Design Stage

- The information exchange platform significantly contributed to the efficient documentation management (2 revisions of the Intermediate Safety Analysis Report were reviewed and 2 sets of review reports were submitted by the consultant);
- However, the use of this platform was limited only to the regulatory side (BNRA and its consultants). The interactions with the operator and design organizations did not take any benefit of a common information system.

Intermediate SAR for Belene NPP

Information Management at Design Stage

- When the design work is conducted by different organizations and in different countries, good coordination and communication are vital for the successful outcome;
- Regulator should assess the adequacy of the communication approach between those designers who are expected to interact during the design process, and between the operator and design organizations;
- The operator should accumulate and preserve the knowledge gained during the design approval process and be capable of using it during the construction, commissioning and operation stages.

Information Management at Design Stage

- For that reasons, the regulators are interested in the development of a Common Information Space (CIS) to be used for knowledge transfer at each stage of plant life cycle;
- During the design stage, the objectives of information exchange between the regulator, operator and designer could be as follows:
  - ✓ to achieve mutual understanding of the design concept, design basis and safety criteria to be applied throughout the project;
  - ✓ to share and discuss specific technical issues, such as the safety relevant systems and systems integration in the design;
  - ✓ to resolve project organization and management issues, including safety and quality management during the project and interactions between key organizations.

Information Management at Design Stage

- Examples of specific technical issues, to be discussed in the common space during the design stage:
  - Safety concept (incorporation of severe accidents in the design);
  - Synergy between safety and security (measures against intentional crash of a commercial aircraft);
  - Safety demonstration of novel safety features (such as core catcher, new passive systems);
  - Substantiation of dual function of specific systems - normal operation and safety function;
  - Safety classification of structures, systems and components.

Information Management at the Construction Stage

- During the construction stage, the exchange between regulator, operator and designer within the common information space could include:
  - Review results of detailed design features of systems, structures and components along with the design progress;
  - Quality assurance and quality control issues during manufacturing and construction and the need for regulatory oversight of licensee, vendor and manufacturers;
  - Outcomes and feedback of conducted site inspections;
  - Organization and management of safety and quality issues.
- The common information space should be used to transfer design knowledge and safety related information to the stage of plant operation.

Information Management at the Operation Stage

During the operation stage, the common information space could be used to contribute to:

- the process of continuous improvement of plant safety and operation;
- the improvement of the operational experience feedback from same and similar type of plants;
- the licensing process of large modernization projects, such as:
  - ✓ installation of severe accident management provisions,
  - ✓ power uprates,
  - ✓ new nuclear fuel projects,

that require extensive regulatory efforts and active interactions with the operating and engineering organizations.

Conclusion

- From regulatory point of view, the common information space could play important role for enhancing the effectiveness of interactions between the involved parties at the different stages of plant lifetime;
- The use of common information space at each stage contributes to the knowledge accumulation, preservation and dissemination, which is a valuable prerequisite for safety;
- The management of design and safety related information during the stages of design, construction and operation, should be considered and regulated as a part of the plant system for management of safety and quality.

Thank You for Your Attention!

"Knowledge Transfer"

The Technical Design Documentation for Belene NPP in Bulgarian, Russian and English languages