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ELECTRONIC INFORMATION MANAGEMENT ON THE QINSHAN CANDU PROJECT

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ABSTRACT

The Qinshan CANDU Project is a two 728 MW_e CANDU 6 reactor nuclear power plant currently being built on the shore of Hangzhou Bay 126 km southwest of Shanghai in the People's Republic of China.

AECL, the nuclear steam plant designer, equipment supplier, construction and commissioning manager as well as the overall project manager, is utilizing a suite of state-of-the-art integrated electronic engineering as well as project management and control information technology based tools on the project.

This paper describes these tools, their use, and the benefits the project is realizing from their use as well the impact these tools and the information they have captured will have on the operation and performance of the plant.

Introduction

The CANDU Qinshan Phase III Project* is a two 728 MW_e CANDU 6 reactor nuclear power plant currently being built on the shore of Hangzhou Bay 126 km southwest of Shanghai in the People's Republic of China for the Third Qinshan Nuclear Power Company Limited (TQNPC). Atomic Energy of Canada Limited (AECL) has overall turnkey responsibility for the project as well as nuclear steam plant design, equipment, fuel and heavy water supply, nuclear steam plant construction and commissioning management and supervision, guidance and training of TQNPC's commissioning and operations staff. Other major project participants include the Hitachi-Bechtel consortium responsible for balance of plant design and equipment supply, Canatom responsible for balance of nuclear steam plant design and indeed TQNPC itself who manages the local Chinese contractors who are undertaking the balance of plant construction. As well they will undertake the day-to-day activities associated with commissioning the plant.

* The official name of the project. For simplicity elsewhere in this paper it will be referred to as simply the Qinshan project.

In order to significantly enhance the engineering, procurement, construction and commissioning activities, AECL has committed to undertaking its scope of work and delivery of the project in a fully electronic and integrated manner. This is being accomplished thorough the use of an integrated suite of electronic information technology tools which manage and control project information and in many cases the production of engineering deliverables. In this paper these tools, their use, and the benefits resulting from their use will be discussed.

1 APPROACH

It is generally recognized that using electronic tools, or information technology in general, to simply automate existing isolated, manual and paper based processes will not yield any significant benefits such as an increase in productivity or the elimination of errors. Indeed in some cases the introduction this technology can result in an overall decrease in productivity.

In order to ensure the maximum possible benefits, the Qinshan project and AECL in general has adopted the following the approach for the implementation and subsequent utilization of electronic tools for information management and control:

- Labour intensive and error prone engineering, procurement, and other project delivery activities are identified. Tools are then put in place which substantially automate these activities, eliminate the introduction of errors and capture all necessary project information.
- The underlying databases used by these tools are integrated to ensure data is uniquely stored and referenced.
- These integrated databases are made available to all project participants who require them to undertake their scope of work.
- The ability to produce deliverables such as drawings, lists, bills of material etc. directly from these integrated databases is implemented wherever possible and feasible.
- Wherever possible use is made of third party, commercially available, supported and proven software
- The information technology providers, responsible for the implementation and on-going support of the tools, work closely and intimately with project staff who use these tools on a daily basis.

2 RESULTS

The Qinshan project has implemented a set of integrated of electronic tools that manage and control information on the plant's

- 3D Plant layout and space allocation
- Equipment, instrumentation, wiring and cabling
- Document, Drawing and Deliverables
- Materials demand and supply

In addition these tools has fully automated the production of engineering deliverables such as:

- Plant general arrangement drawings
- Plant piping isometric drawings
- Various lists such as equipment lists, instrument, Valve, environment qualification component lists, digital control computer input/output lists
- Various Instrumentation and Control related drawings such as end-to-end wiring drawings, instrument loop drawings, cable block diagrams etc.
- Bills of material, supply demand reports
- Construction and commissioning/turnover work packages
- Various project management reports such as exception

The use of these tools is proving to have a significant impact on the project for example to date,

- There has been a significant decrease, based on earlier projects, on the amount of labour required producing various deliverables.
- The need to reconstruct information for various project participants, or as the project progresses has been eliminated. For example complete construction work packages by area are automatically produced for the construction forces.
- There has been no rework required in the placement of embedded parts in the reactor buildings. All engineering interferences have been eliminated.
- Document shipping costs have been reduced to near zero due to the issuing of all documents and drawing electronically.

In addition to their use during the engineering, construction and commissioning of the plant, as a result of using these tools at the end of the project, i.e. at the turnover to the owner for operations, the plant's owner/operator will be in possession such electronic information assets as:

- a complete set of electronic (as-built) drawings and documents including history files
- a single (rudimentary) equipment data base (tags and assets)
- a wiring and cabling database
- a material inventory database
- a set of integrated safety analysis files/documents
- intelligent (design) plant flowsheets
- a 3D Plant Model database

Possession of these information assets will have a significant impact on the plant operations. For example:

- Anybody will be able to easily and immediately retrieve their documents and drawings
- Operators will be able to visualize the plant

- Maintainers will know the design and maintenance documents related to particular tags and assets
- Regulator will know history of assets
- Maintainers will know and have access to maintenance and calibration data
- Procurement staff will know spare parts status in warehouse
- Technical unit will be able to rapidly and easily update information, ensuring it correct and consistent

3 CLOSING STATEMENT

These tools, by ensuring the correctness and completeness the of information needed by the project, facilitating sharing of this information amongst the project's participants and automating various deliverable production processes are having a significant beneficial impact on the project.

In addition to its value during the engineering, procurement, construction and commissioning of the plant, the information gathered by the tools described in this paper will be a valuable aid to operating, maintaining and managing the configuration of the Qinshan CANDU plant once it enters commercial service.