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Workshop H: 원전 형상관리 추진현황및 향후 계획

Case Study on Configuration Management System Strategy and Implementation at Krsko NPP, Slovenia

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Agenda

- 1. Introduction
- 2. CM Strategy
- 3. CM Processes
- 4. CM Lifecycle
- 5. CM Systems and IT
- 6. KPMIS Krsko Plant Management Information System
- 7. Conclusion





1. Introduction - Background

"[Krsko] NPP received the highest total rating for nuclear safety and operational readiness. By presenting the review results, the mission members pointed out the above-average high implementation of recommendations of international operational experiences and safety achievements." (WANO, 2014)



[NEK] was a host to numerous international delegations who visited the power plant on the recommendation of the World Association of Nuclear Operators (WANO); the Association is known to give our plant as an example and good opportunity for the transfer of best practices.



Often Referenced as Model Plant by IAEA for Operations and CM. OSART missions consistently in top rankings.



Operating history of a total of 1-2 unplanned trips over the last 10 years of operation, averaging 35,000 hours of continuous FPH, generally non-stop operation between refueling outages.

Krsko Nuclear Power Plant







Physical Configuration

(What is actually in the Plant)

Configuration Information

(What we say is in the Plant, or "As-Built")





2. Configuration Management Strategy







2. CM Strategy - Loss of CM Equilibrium





2. CM Strategy - Loss of CM Equilibrium



Equipment and/or Parts are not selected to support the design basis and requirements. Caused by poor Engineering Design Change or poorly maintained design basis. Also, misunderstanding of Design Requirements

Physical Plant Equipment

Plant Documentation



2. CM Strategy - Loss of CM Equilibrium





3. CM Processes





















Configuration Management integrity (equilibrium) over the NPP Lifecycle. Note plant lifecycle stages and inflection points where potential for configuration and design basis loss, and subsequent design basis reconstitution, is greatest





 Design and Construction Westinghouse and Gilbert Design Local subcontractors High tacit KM; Almost no formal knowledge transfer system or PIM 	 Turnkey Operation Westinghouse and Gilbert design control and engineering Design Changes managed as projects Low level of Owner design control, competency management or Design Knowledge transfer. PIM not considered necessary. 	 Owner-Controlled Operation More internal contracting Expansion of suppliers to AREVA and others Development of information, CM and knowledge capture IT systems for design basis. Establishment of Engineering organization at Krsko NPP to manage design changes. Self-managed Steam Generator Replacement Recognition of Plant Information Model as key element of data and knowledge management 	 LTO and Life Extension File application for life extension with Regulator; awarded 2010 for 20 years. Continue to prove nuclear excellence, competence and knowledge management. Develop MIS 2.0 with Oracle ERP and higher PIM compliance for ISO- 15926, STEP, etc.
1975 – 1982	1982 — 1991	1991 — 2005 + SG Replacement	2005 - 2030



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5. CM Systems & IT - The "Big 5" Functionality



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6. KPMIS – Krsko NPP

Krsko NPP realized, after 10 years, that:

Krsko NPP did not know what equipment was in the plant, or where the equipment was located.

They did not have a Master Equipment List (MEL).

They did not have an effective or complete document management solution for FCI.

Design documents were not cross-referenced to equipment items, work orders or design projects.

Most plant modifications provided very little documentation as work was performed by third parties with little turnover, resulting in gaps in the design basis.

Other configuration information, such as design basis and even bills of material and parts, did not exist.

A central source of general equipment data, or even what was actually contained inside the plant, was not kept in a facility where it could be referenced by NPP staff.





6. KPMIS - Data Acquisition & re-establishment of the Design Basis





6. KPMIS - Steam Generator Replacement

Steam Generator Replacement

- Replacement of 18 year-old Units
- \$120M Program

Preparation and Manufacture

- 18-24 months engineering and planning
- New Steam Generator fabrication and design transfer
- Virtually every system reviewed for power recovery/uprate (10%-15%)

Installation of Steam Generators

- Removal and Replacement of Steam Generators over 60-Day Extended Outage
- Configuration, MEL, Design Basis and KPMIS Updated from Field Change and Test Data

CM and IT Systems

- KPMIS provided complete MEL, FCI and Design Basis
- Engineering Design Packages and progress tracked in KPMIS
- CM and IT support for Vendors and Subcontractors praised for CM speeding up work, quality
- Licensing work expedited by KPMIS





6. KPMIS - IT Architecture and Technology

Krsko Plant Management Information System

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Sample KPMIS system user interface. Major equipment list (MEL) and detailed determinent information



7. Conclusions

One of the ways nuclear power plants ensure safety and viability is to maintain a Configuration Management (CM) program. Such a program impacts virtually all business activities in operating a nuclear plant.

The Krsko NPP has effective internal methods for controlling plant maintenance and its configuration management activity.

NPP Krsko has reviewed KPMIS replacement technology, such as Ventyx Asset suite and other commercial off the shelf (COTS) products compatible with Oracle database products, but has not, to date, announced any significant changes to the KPMIS program.



Thank You.

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