Configuration Management Benchmarking Group
Regional Workshop in Slovenia

International Atomic Energy Agency

TC Project RER/4/025

Regional Workshop on Configuration Management Through Plant Service Life

Ljubljana, Slovenia, 19-23 November 2001

Report

Prepared by the workshop participants

1. Summary of the experts' presentations

During the workshop in Ljubljana, November 2001, on Configuration Management (CM) through plant service life, several presentations from different countries and organizations were performed (see the attached program for more details). Below are the experts' presentations summarized.

Lief Wright Erickson, Battelle, Pacific Northwest National Laboratories, USA

In the definition of CM it was pointed out that it is important to have an integrated process to ensure that design requirements are defined and documented as well as design changes need to be controlled and documented throughout the life of the plant. Hereby the documentation will conform to the physical configuration of the plant. Some of the benefits having a good system for CM are that you will need less time searching the information and you will receive more reliable information.

Describing the existing practice of CM in USA it was specifically pointed out the importance of assessment to continuously improve the CM process. Review by a safety committee and by peers contributes to a higher quality in the CM process.

The U.S. Department of Energy/National Nuclear Security Administration sponsors CM activities regarding databases and design bases documentation in Russia and Ukraine.

Bill K. H. Sun, Sunutech, Inc, USA

The problems and concerns associated with nuclear power plant documentation were addressed. It was pointed out that older NPP facilities have not integrated and consolidated design bases and relevant documentation, such as those used for construction, commissioning, operations, maintenance, and decommissioning for the whole lifecycle of the NPPs. The modern computer and information technologies along with the hardware and software technologies can provide new design tools and capabilities for electronic recording, storage, retrieval, processing, and distribution of information for treatment of documentation in NPPs. The presentation also described an IAEA effort in producing a technical information report to provide its member states recommendations and guidance on the utilization of information technologies in plant documentation for support of plant operations throughout its lifecycle.

The content of the IAEA report, which is entitled, "Information Technology Impact on Nuclear Plant Documentation", was described. The presentation covered background and IAEA rationale, requirements and needs of documentation at NPPs, planning information technology, guide on design and execution of the information technology project, examples of information technology implementation at different countries, issues and concerns for application of information technology in NPPs, future trends, conclusions and recommendations. It was recognized that advancement of information technology and needs of efficiency and effectiveness in NPP performance and safety lead to wide applications of information technology for documentation process throughout utilities and reactor designers around the world. It was further pointed out that as most NPPs were built in the 1970-1990, documentation is largely paper-oriented. The trend has been to move from paper-centric documentation toward data-centric documentation where documents are automatically generated from information stored in databases. The hardware and software technology provides capability for electronic recording, storage, retrieval, processing, and distribution of information. In the long run, the application of information technology on NPP documentation can enhance the productivity, performance and safety of the NPPs.

Jurgen Lockau, Framatome ANP GmbH, Germany

A presentation was made of modern information technology and NPP documentation. For new plants 3D-CAD is generally applied for the construction of new plants. The techniques for using a 3D model for virtual reality is now available and can be used for design review, training and information. Introducing an Engineering Data Management System (EDM) will save time and costs.

A presentation of an IAEA report "Configuration Management Guideline", draft October 2000, was done. The advantages and challenges were discussed. The need for continuously doing improvements was pointed out. The guideline is not aimed to give a step-by-step guidance for developing a CM program. The purpose is to describe the various aspects that need to be considered in the development and implementation of a systematic plant CM system.

Walter Korn, Framatome ANP GmbH, Germany

A presentation was performed of an Engineering Data Management System (EDM) which is a technical information system for digitally capture, create, analyze, process, reference, manage and save all kinds of documents and their contents. By this system a common platform for information is built which can be used of project managers, designers, etc.

A demonstration of Virtual Web Plant was shown. This tool will be very useful for design, training and information. All kind of information is linked to the components like for example system flow diagrams, component datasheets and corresponding drawings.

A 3D-CAD model for documentation of all disciplines was described. This as-built model gives reliable and fast information that is needed for technical work and costly mistakes can be minimized.

Another short presentation was performed for a system, which allows to make old paper drawings intelligent, for example system flow diagrams or isometric drawings thus to work on it later in electronic form and for proper documentation.

Jan-Anders Svensson, Sweden

A presentation of the safety aspects of the CM process was addressed. It is important to always have access to correct information for safe operation of a NPP. By this mistakes in operation and maintenance can be minimized. To make sure that correct information always is available a CM system has to be

established. Procedures must be developed that guarantee updating of all documents when needed. Besides you must periodically review and audit the CM system to make sure it works properly.

A good working CM system is extremely important for the modification process. If all necessary documentation is not kept up to date after changes are made in the plant it will result in unconformity between the documentation and the physical configuration.

For many older plants there is a need to reconstitute the design bases for the plant. Doing this the Final Safety Analysis Report (FSAR) will be updated according to the latest knowledge and experience. As a consequence of the reconstitution of the design bases the actual physical design of the plant will be checked against the design requirements. If discrepancies are found they have to be eliminated. Reconstitution of the design bases requires a lot of resources and time. Since the reconstitution is done it is important to continuously keep the FSAR documentation up to date.

Zoran Heruc, Nuclearna Elektrarna Krsko, Slovenia

To support a safe and reliable operation, Nuklearna Elektrarna Krško has undertaken a long-term strategic program to provide the plant personnel and management with timely access, accurate and transparent data to assist them in conducting their jobs and in making decisions. Configuration Management (CM) objectives at NEK are to ensure consistency between design requirements, physical plant configuration and configuration information. Software applications, supporting design change, work control and document control processes, are integrated in one module-oriented Management Information System (MIS). From configuration management perspective, Master Equipment Component List (MECL) database is the central MIS module. Through a combination of a centralized database and process migrated activities (modifications, plant operation, maintenance, document control etc.), it is ensured that the CM principles and requirements are followed and fulfilled.

A modernization project (purchasing and replacement of two Steam generators) was used to demonstrate how a significant change was addressed through the plant CM processes.

Marijan Podhraski, Nuclearna Elektrarna Krsko, Slovenia

A presentation of the Master Equipment/Component List (MECL) was performed. The database contains mechanical, electrical and I&C components. It ensures consistency between the design requirements and the physical configuration of the plant which was verified by walk down of the entire plant.

Andrei Kossilov, IAEA

A presentation of the IAEA activities in the Engineering and Management Support for Competitive Nuclear Power for 2002-2003 was performed. The main project tasks were presented as well as the subprogram implementation approach including the provision of technical cooperation.

2. Status of Configuration Management (CM) in the Member States and National Achievements useful for other countries in the region (based on the participants' presentations)

Armenia

Configuration management at NPP is a new approach for Armenia. In the past years, some activities were performed within the scope of configuration management, but these activities were not integrated and understood as in the CM direction.

Bulgaria

In the Units 5 and 6 in Kozloduy NPP, several plant guidelines were developed which defined the basic requirements for performing work related to system management, document control, records management, and design change control. Following these requirements, the QA departments that are responsible for the units developed their precise and detailed procedures, which corresponded to the guidelines. At the present moment, these elements are implemented and maintained at the nuclear units of Kozloduy NPP.

The procedure for document control covers all requirements defined by the CM standards. There is a database for controlled documents, which currently consist data for 1854 procedures and 1015 controlled drawings. The database generates the documents ID numbers and stores information for the document owner, date of issue, number of changes, periodical checks, distribution, relation to certain system, etc. It is updated when a new document is issued, superseded or planned for development. It is the basic tool for document control. It is obligatory for the archives in fulfilling their responsibilities related to document control.

The procedure for record management covers all requirements defined by the CM standards and national legislation. There is a database for records, which currently consist of data for more that 30,000 design documents, protocols, specification, vendor documentation, etc. The Records management database generates the numbers of newly created documents and stores information for location of a certain document in an archive, originator of the document, relation to a certain system, relation to other documents, etc. Units 5&6 have currently two central archives and several smaller archives in the departments. They all work perfectly together since there are guiding procedures and good structured databases.

The procedure for design change control covers all activities defined in the CM standards and national legislation. There is a database obligatory for usage for all personnel that take part in design change process, including change proposal, development and approval of change package, implementation of change in the plant, documenting the change, updating the related documentation and notifying the personnel. The possibility of implementation of unauthorized changes is fully eliminated. The multiple assessments contribute for needed, effective and cost-reasonable design changes as well as for the interfaces with other CM elements.

There are several documents that guide the different types of assessments related to configuration management, like audits of planned activities, assessments of CM system functioning and assessment of the current status of configuration, documentation and design requirements. Quality audits are used for assessments of management activities related to configuration management, plant assessments and CM. System functional inspections are used for assessments of CM system and assessment of the current status of configuration, documentation and design requirements. There are approved criteria, which are developed in a checklist form for the purposes of the assessments.

Hungary

The most important item is that there was a high ranking review mission (OSSART) in the nuclear power plant. They did not have any findings in the topic of configuration management. All of the old Russian drawings are fully digitalized. A complete 3D drawings of systems where made. They are used also for training of the staff. NPP procedures in the framework of configuration management are completed. The regulatory requirements are also ready. Currently, the NPP has many separated databases. The problem of the future is to connect these databases. An administrative software called SAP is used for configuration management and documentation handling.

Lithuania

The achievements in the framework of configuration management at Ignalina NPP are: Quality Assurance Program is developed and successfully implemented. Plant Modification Control System is developed and fully implemented. Operational Control Configuration Procedure for safety related systems is developed and fully implemented. Safety Analysis Report for Unit 1 (SAR-1) is done and approved by Regulatory Body (VATESI). License for Unit 1 operation is received. Safety Analysis Report for Unit 2 (SAR-2) is in process. Computerized Documentation System (ARKI) is developed and fully implemented. Computerized Maintenance Control System (RMMS) is in process of active implementation. This includes database of plant systems, equipment and components. Ignalina NPP and its Technical Support Organizations has developed: Aging Control Program. Non Destructive Evaluation Program. Equipment Maintenance Programs. Probabilistic Safety Analysis of Level 1 (PSA-1) – Project BARSELINA is done.Probabilistic Safety Analysis of Level 2 (PSA-2) is in process.

Configuration Management System of Ignalina NPP is implemented in general.

Romania

In Romania, elements associated with the configuration management were implemented at Cernavoda NPP Unit #1 during the early commissioning phases. Since then, a Design Change Control process was implemented and also other two processes Key Commissioning Objectives and Commissioning Completion Assurance were in place to ensure and document that the design bases were identified. The implementation was proved by testing that they are satisfied by the as commissioned systems.

Since the plant is in commercial operation, further steps towards CM elements improvement were made. These include the following: The AS Built program that was initiated during the last commissioning phase is completed and currently all design drawings are in AUTOCAD. A Master Equipment List project was initiated two years ago and is still undergoing but nearly completed for the first level. Technical review and organization of design documents which describe the Equipment-Component design requirements is being carried out for two years within a program called TS/DS Program, still ongoing. MEL database is currently correlated with TS/DS database. (TS is the equipment and component technical specification and DS is the data sheet.) A new Design Change Control process was developed including associated procedures and is being implemented for a year. The new process incorporates the industry best practices and was expertised by an IAEA Mission at Cernavoda NPP site. All procedures associated with Operational Configuration Control are in place and have been updated to include the operating experience. Main procedures related to the subject are Jumper Records, Conditional Release of Materials, Work Plans, Work Request, Operating Manuals and Instructions, and the processes are all correlated with the design change control process. Specific and detailed procedures are implemented for documentation, drawings management and control. The FSAR was updated in 2000 to include all design modifications implemented by the end of 1999. In the interest of providing appropriate technical expertise for design changes, CM related activities and other key processes, a project was initiated within Tech. Division to develop and implement two new functions: Component and Procurement Engineering. This project is coordinated under IAEA Technical Cooperation Program umbrella and also covers the development of aging and life management program.

The following improvements were introduced by the new Design Change Control process:

Clear management policy, split of responsibilities, and directions related to the process are provided. Requirement for an effective preliminary technical evaluation of proposal for design changes was introduced to ensure that is needed and to document the justifications. A screening process was designed to make distinction between a permanent design change and an Equivalent Replacement process, which is governed by a specific procedure to ensure that technical evaluation is performed in accordance with

applicable codes and standards, is documented properly and documentation affected is identified and updated. Approval of the design modification is granted by a committee when the conceptual design is completed and after completion of technical evaluation of the modification potential impact on nuclear safety, design and license bases and other key areas. Additional requirements were imposed for the design development phase like design plan for multidisciplinary modifications, project coordinator, independent verification of conceptual and detailed design, identification in early stages of all design and license documentation affected. Additional and specific requirements were imposed for the process of Modification Work Package preparation which is used for field , installation and testing and becomes at the end modification history file and includes all documents and records associated with installation. Improved control of actual field work is ensured and compliance with the design requirement is documented for the as installed modification. For modification close out phase a better control of documentation update process is imposed by specifying for each document the required milestone for update completion before implementation, when modified system is declared available for service, during close out of the package and the outstanding ones no later than 3 months from implementation. The process monitoring is currently accomplished using an ACCESS data base which reflects the entire process.

Slovakia

The CM was evaluated in the NPP EBO several times in the framework of the international missions. The Shortcomings and the deviations from the international recommendations were stepwise removed. In the last missions (as f.e. WENRA M. OR IAEA M.) the CM levels have been evaluated and the conclusions were very positive. The achievements are:

(1) QA Program has been established and fully implemented in NPP.
(2) In the framework of QA Program, the QA standard was elaborated for Document Management.

The standard established not only the principles of documentation management, but also the following:

(1) Responsibility for creation, approval, distribution and innovation of documents were established.
(2) QA standard for management of design documentation was elaborated.
(3) Established system of updating of drawings in the framework of modification implementation.
(4) Archiving rooms are protected by fire detectors. The documentation is issued in two copies that are stored in two physically separated buildings.
(5) The database of controlled documents is updated on-line for safety evaluations. Only controlled documents are used for designing of modifications and for safety evaluation.

However, it is needed to improve the documentation unification (above all drawings documentation) and the storage of documentation into the digital form (including the archiving in the digital form). EBO NPP has elaborated a QA Program for software document management of the digital system, which has been planned to implement in the NPP including the software change and modification documentation.

Slovenia

To support safe, reliable and economic operations, maintenance, engineering and modifications, Nuklearna Elektrarna Krško (NEK) has undertaken a long-term strategic program to provide the plant personnel and management with timely access, accurate and transparent data to assist them in conducting their jobs and in making decisions. Configuration Management at NEK is a policy and the way the business is carried out with distributed ownership. The controls are provided as a necessity to ensure that the physical and functional attributes of NEK plant structures, systems and components are consistent with established design configuration. They also ensure that the plant is designed, constructed, maintained and operated consistent with the design bases, and that the information

describing these attributes is readily accessible. The CM objectives are fulfilled through a combination of a centralized relational database – MECL (Master Equipment Component List) with a Module Owner, controlled updates & interfaces and activities migrated in major processes (modifications, maintenance, documentation management etc.) correlating with the centralized application. Strategic approach to CM, process and tool development (MECL database that was defined and developed to serve as the central media for configuration management information deposit), projects undertaken (plant walk-downs etc) lessons learned and recommendations were presented. Functions of The Configuration Management Group and its major tool – Master Equipment List were presented in detail with special emphasis on the interfaces to processes and computer applications and independent monitoring of CM impacting processes. Modernization Project (purchasing and replacement of two Steam generators, power up-rate, licensing and safety analyses, full scope plant simulator) was used to demonstrate how a significant change was addressed through the plant Configuration Management processes.

Russia

The requirements on NPP Configuration Management and Configuration Control are established in the current operation licenses, nevertheless the term "Configuration Management" is not defined and not used in practice. Guidelines for Configuration Management exist in form of license procedures and procedures on Quality Assurance in different areas like the documentation control, project change control, etc.

There are different databases on equipment and documentation at Russian NPPs.

At Novovoronezh NPP within the framework of the pilot project on Configuration Management, the integrated database is developed. The database consists of information on equipment, documentation and project requirements. At the present time, the software testing of the database is under way. It is planned that the database will be in normal operation in two years.

Ukrain

All utilities of Ukrainian NPPs were designed in 1970th years according to the normative requirements (documents) acting in that time. During operations, a lot of modifications were carried out. Moreover, in the beginning of 1990th years, after breakup of the USSR, new national normative documents on nuclear and radiation safety were entered into the force. All those have resulted in the change of NPP designs and required both realization of comparison of original design documentation with one using at NPPs and elimination of discrepancies between the actual physical configuration and as-built design documentation.

In 1998, initial steps were taken to establish a CM Program at Zaporizhzhya NPP. However this project was halted in 1999 due to reduction of funds. Currently, Ukraine has the new project titled «Design Documentation System Management for the Safety Analyses of Ukrainian NPPs with VVER 1000 type reactor» (DDSM). Results of the CM Project at Zaporizhzhya NPP will be used in the new project. The DDSM Project is providing applications to all Ukrainian NPPs.

The main tasks of DDSM Project are:

a) Design documentation inventory at NPPs and designers (KievEnergoproekt and KharkivEnergoproekt)
b) Development and Implementation of NPP administrative procedures for design documentation management
c) Development of pilot Design Bases Documents (DBD). Collation and reconstitution of design bases
d) Development of NPPs Management Design Documentation System including:
    1) Design documentation database
    2) SSC database (electronic MECL)

In 2002, the pilot DBDs will be prepared. Currently, Ukrainian NPPs are developing local databases of equipment and design documentation.

The achievements of these projects consist of the following:

1. Ukraine will prepare the guidance (template) for development of DBDs.
2. Ukraine will prepare the procedure for preparation and maintenance of DBDs.
3. Both documents will be useful for other countries operating VVER 1000.
4. Countries operating VVER 1000 should use the design bases of pilot systems.

3. Current issues and needs

The main current problem can be seen from the table below and can be described as follows. The existing guidelines by IAEA are in draft form at the moment. They should be finalized and released as soon as possible. Additionally the participants very much are missing the link between the guideline and the specific work procedures needed for the daily work (see topic missing guideline in table). The solution could be "Best practice sharing" by a collection of best practices from different countries in a report under the auspices of IAEA. Further a regular exchange of information on the staff level following the example of the US utilities joined in Configuration Management Benchmarking Group (CMBG) should be initiated. This meeting should be sponsored at least in the beginning by IAEA to neutralize competition between the utilities. Configuration Management (CM) cannot be implemented properly without support by NPP management. A cost/benefit analysis will be very helpful for the introduction of CM. This analysis could be also given in the frame of best practice sharing showing examples of utilities practicing CM. The support of the NPP management is a key factor for the introduction, as a lot of obstacles must be overcome. Among this is the integration of the existing dispersed databases into one common information system.

	Topic	***Issues***	***Solution***
1	Management	Deviation between the planned and realized work of the subcontractor	Direct work with the subcontractors
2		More detailed information about running CM systems on-site	Learning by looking - facility visits and international cooperation
3		Separated, non integrated, process oriented data bases	One common information system
4		Financial support is missing	Management support
5		Obtaining management understanding and support	Define responsible person
6		Culture shock (process complexity, transparency, new information systems technologies)	Constant training
7	Incomplete design basis	Design information is missing - for example: initial root cause is a fire in cable channel, routing information is missing	Create missing drawings, create storage system

8		Design data is difficult to obtain due to disintegration of the organization of the original designer	Create missing drawings, collect the missing data
9		Original spare-parts are not obtained because original suppliers do not exists	Specification of the equipment and establish a new provider
10	Missing guidelines and standards	Need for self evaluation process and criteria for evaluation	Best practice sharing and creating a methodology
11		IAEA tech docs are still drafts	Release reports ASAP
13		Generic methodology for implementation of CM is missing	Best practice sharing
14		CM standards for compliance are missing	Create proper CM codes and standards
16		Scope of equipment and documents that have to be included in CM have to be defined	Define criteria for equipments and documents
18		redundant and ambiguous information due to lack of integrated information system	One integrated information system
19		Good practices for implementing information systems	One integrated information system
20		Guidance for designing an information system to support CM implementation	Management support, Define activities to develop a CM program and Develop gradually, Put change control in place

4. Conclusions and Recommendations

Conclusions

(1) It is obvious that experience of operating nuclear plants and practical examples and lessons learned from those who had made accomplishment on configuration management generated a lot of interest among IAEA member states representatives.

(2) The workshop participants consider the IAEA assistance in the configuration management as very important and suggest continuing the approach in order to guide member states on a systematic approach in configuration management development and implementation.

(3) There is general recognition among the participants that configuration management is closely associated with quality assurance, documentation management, and nuclear safety.

(4) As NPPs in different countries have different databases, practices and experiences, there is a common drive among member states to exchange good practices and standards to promote harmonization.

(5) It is recognized that configuration management practices are really needed to facilitate decommissioning of NPPs.

(6) Configuration management results should be used for training and education of new people at NPP sites for quality assurance and nuclear safety.

Recommendations

(1) A greater involvement of western operating nuclear plants, especially with those who understand the environmental, cultural, and other significant and influential factors at the participants' locations, is highly recommended for IAEA to organize future workshops on configuration management.
(2) It would provide a good method of transfer of know-how and technical exchange of national experiences if IAEA could work with WANO with participants of "western plants" in the workshop.
(3) Training and teaching of the fundamentals on configuration management and information technology applications on NPP documentation are recommended for future workshops.

(4) It is recommended that IAEA could organize separate workshops on major processes that impact configuration management, with emphasis on plant modifications, work management, document control and records management etc.

(5) The development of a guide book on the planning and design of configuration management projects would be useful to the IAEA member states for their implementation of their own configuration management programs at their NPP sites. The guide book should emphasize specific steps, concise guidelines, and good practices in simplified forms and step-by-step approaches to facilitate users.

(6) It is recommended that the member states of IAEA develop an acceptable and commonly understandable term "Design Basis (Design Requirements)". It would be useful to disseminate information about existing databases supporting configuration management process at European NPPs. The requirements to control a database, in particular, the structure and contents of the required information and the minimum information required for database to access, interfaces, and reports, etc. should be specified.
(7) To promote further use of configuration management techniques for the enhancement of nuclear safety, it is recommended that the regular meetings as "European Configuration Management Benchmarking Group" should be held. These meetings should consider the following subjects:a. information on the state of the art b. experiences exchange c. best practice sharing d. lessons learned communication e. expert meetings (workshops) with experts from Germany, France, UK, etc. f. visit of plants with good experience (Germany, UK, Spain, France, etc.) g. agreement on an integrated electronically data management h. based on interests and needs of the utilities