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IAEA guidance documents on Ageing Management of key safety components in nuclear power plants and Safety Knowledge-base on ageing and long-term operation (SKALTO)

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Abstract

To assist Member States in managing NPP ageing effectively, the IAEA has developed a set of programmatic guidelines, review guidelines and component specific guidelines for major NPP components important to safety, and ageing management review guidelines.

The newest component specific guideline for PWR primary piping was published in 2003 and covers latest practices in the USA, France, Germany, Japan, Russia and other WWER owner countries. In addition draft component specific guidelines for BWR Reactor Pressure Vessel, BWR Reactor Pressure Vessel Internals, Updating of PWR pressure vessels and Updating of PWR vessel internals are to be published.

The Agency is also developing a Safety Knowledge-base on Ageing and Long Term Operation (SKALTO) to preserve the knowledge related to long term operation and share it with MS,. The goal of SKALTO is to identify and store relevant knowledge (or provide links to relevant knowledge sites) in order to facilitate its retrieval, updating, extension and dissemination to potential users.

This paper introduces a summary of the Agency's activities relating to safety aspects of ageing management with special emphasis on the new component specific guidelines for PWR primary piping, BWR RPV and Core Internals, PWR RPV and Core internals as well as future direction and plans of the Agency's activities. A basic information on SKALTO is also provided in the paper.

1. Introduction

At present, there are over four hundred operational nuclear power plants (NPPs) in IAEA Member States. Operating experience has shown that ineffective control of the ageing degradation of the major NPP components (e.g. caused by unanticipated phenomena and by operating, maintenance or manufacturing errors) can jeopardize plant safety and also plant service life. Ageing in these NPPs must be therefore effectively managed to ensure the availability of design functions throughout the plant service life. From the safety perspective, this means controlling the ageing degradation and wear-out of plant components important to safety within acceptable limits so that adequate safety margins remain, i.e. integrity and functional capability in excess of normal operating requirements.

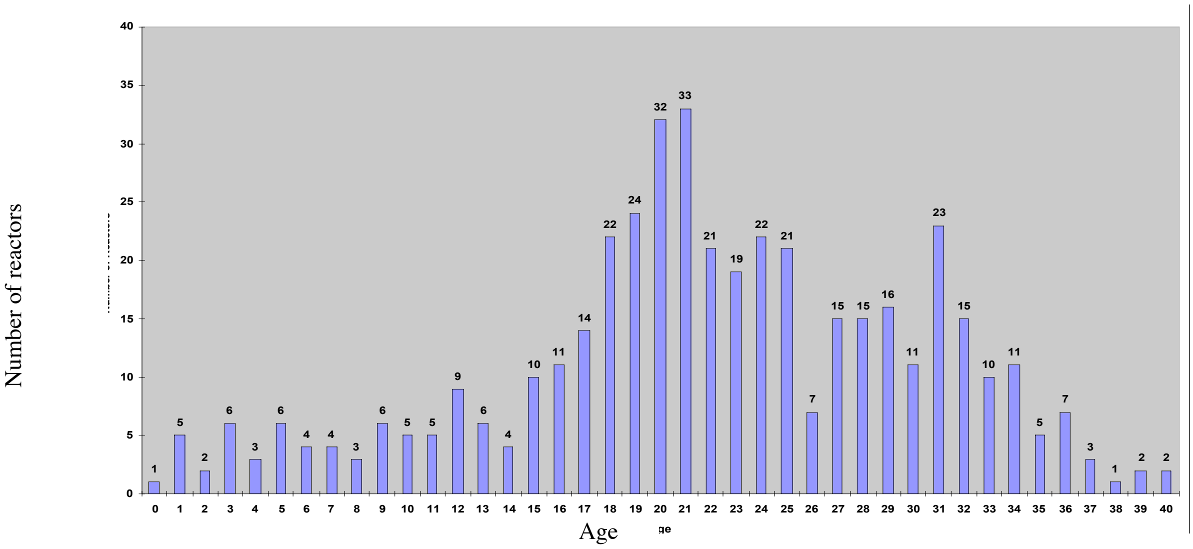

Fig. 1. Number of reactors in operation by age (11 March 2005)

The Agency initiated activities to promote information exchange on safety aspects of NPP ageing in 1985 to increase awareness of the emerging safety issues relating to physical ageing of plant Systems, Structures and Components (SSCs). Agency follow-up activities were focused on understanding ageing of SSCs important to safety and on effective ageing management of these SSCs. The Agency has developed a technical document on Safety Aspects of Nuclear Power Plant Ageing [1] and a set of guidance documents to establish systematic ageing management programmes, in order to assist Member States in managing NPP ageing effectively.

Currently the Agency activities mainly focus on expanding and updating these guidance documents and on facilitating Member States to use the IAEA guidance documents through workshops, seminars and expert missions.

Above activities are performed by the Department of Nuclear Safety and Security and therefore from safety point of view. At the same time, the Department of Nuclear Energy is conducting plant life management (PLiM) activities mainly from economic point of view. Both departments are closely cooperating for each other.

2. Current IAEA Activities on Ageing Management

(1) Guidance Documents on Ageing Management

The guidance documents the Agency has developed are divided into three groups, i.e. programmatic guidelines, component specific guidelines for major NPP components important to safety, and the ageing management review guideline.
The following programmatic guidelines provide guidance on generic Ageing Management Programmes:

- Data Collection and Record Keeping for the Management of Nuclear Power Plant Ageing [2];
- Methodology for the Management of Ageing of Nuclear Power Plant Components Important to Safety [3];
- Implementation and Review of Nuclear Power Plant Ageing Management Programmes [4];
- Equipment Qualification in Operational Nuclear Power Plants [5];
- Proactive Ageing Management [6];

The component specific guidelines provide component description and design basis, potential ageing mechanisms and their significance, operating guidelines to control age related degradation, inspection and monitoring requirements and technologies and assessment and maintenance methods. Respective roles of major NPP programmes in the management of ageing and an approach for integrating them within a systematic ageing management process has been published in the following comprehensive technical documents on Assessment and Management of Ageing of Major Nuclear Power Plant Components Important to Safety:

- Steam generators [7];
- Concrete containment buildings [8];
- CANDU pressure tubes [9];
- PWR pressure vessels [10];
- PWR vessel internals [11];
- Metal components of BWR containment [12];
- In-containment I&C Cables Volume I and II [13];
- CANDU reactor assemblies [14];
- PWR primary piping [15];
- BWR Reactor Pressure Vessel [16];
- BWR Rector Pressure Vessel Internals [17].

- Updating of PWR pressure vessels (in preparation);
- Updating of PWR vessel internals (in preparation).

The ageing management review guideline [18] is a reference document for IAEA Ageing Management Assessment Teams (AMAT) and for utility self-assessments. These reviews can be programmatic (strategy, organization, activities, results, and monitoring) or problem oriented (components or structures or mechanisms).

(2) Application of guidance documents through training courses and workshops

Development of the above guidance documents is beneficial in itself because it provides opportunities to address important issues of common interest and to learn from each other. However, it is the actual application of guidance that has a more significant impact on nuclear safety. The Agency, therefore, devotes significant effort in assisting Member States in the application of its guidance through training courses and workshops.

Interregional, regional and national training courses/ workshops on Ageing Management have been held within the framework of the Technical Cooperation (TC) programme, primarily for participants from developing Member States.

The following TC programmes are currently on-going and include workshops and/ or expert missions on Ageing Management:

- License renewal of Paks NPP operations in Hungary (HUN/4/014)
- NPP lifetime management in Ukraine (UKR/4/013)
- Integrity Assessment and Life Extension of the Laguna Verde Nuclear Power Plant-Plant
- Life Management Programme (MEX/4/53)
- Development of Ageing Management Programme for NPPs in China (CPR/4/026)

In addition, it is worthy to note that the IAEA extra budgetary programmes (EBP) such as EBP Asia also provide similar services based on specific requests from Member States.

(3) AMAT mission

The Agency provides review service missions to assist Member States to establish systematic ageing management programmes, which are called Ageing Management Assessment Teams (AMAT). These reviews can be programmatic or problem oriented. The scope of a programmatic review of an NPP Ageing Management Programme (AMP) includes AMP strategy, AMP organization (including adequacy of resources), AMP activities, AMP results (e.g. physical condition of SSCs), and AMP monitoring (self-assessment and continuous improvement process). A problem oriented review is focused on specific age-related problems or issues which could be specific components or structures, (e.g. pumps, steam generators, cables, valves, structures) or specific ageing mechanism (e.g. irradiation/thermal embrittlement, fatigue, corrosion, wear).

The pilot AMAT mission was conducted in 1999 at Karachi Nuclear Power Plant (KANUPP) in Paksitan. Full scope AMAT missions were conducted at Borselle NPP in Netherlands in 2003 and at Armenian NPP in 2004. Reduced scope missions were also performed at NPPs in Lithuania, Armenia and Ukraine.

3. Technical features of new component specific guidelines

The new components specific guidelines include latest information on significant ageing mechanisms and operational experience and practices in Member States relating to assessment, inspection/ monitoring and mitigation of ageing mechanisms. The following subsections provide a scope, significant ageing mechanisms and technical features of assessment, inspection/ monitoring and mitigation practices shown in the new guidelines.

(1) Primary piping in PWRs (TECDOC-1361)

TECDOC-1361 [15] published in July 2003 provides the technical basis for understanding and managing the ageing of PWR (including WWER) reactor coolant system piping to ensure that acceptable safety and operational margins are maintained throughout the plant service life. The PWR primary system piping constitutes a barrier to the release of fission products and activated species to the containment during normal, off-normal, accident and test conditions. The large diameter primary system piping (main coolant piping) carries the hot coolant from the reactor pressure vessel to the steam generators and then provides cold coolant back to the vessel. The other piping facilitates plant operation and plays a role in mitigating any off-normal or accident conditions. Therefore, maintaining the structural integrity of this piping is essential to the safe operation of a PWR plant.

1) Scope

The reactor coolant system piping is a part of the reactor coolant pressure boundary and includes main coolant piping, surge and spray lines, Class 1 piping in attached systems, and small diameter piping (diameter $\leq$ 25.4 mm) that cannot be isolated from the primary coolant system. The attached systems in US PWRs include safety injection system, charging and purification system, residual heat removal system, auxiliary spray system, and core flood and incore monitoring systems. In addition, vents, drains and instrumentation lines up to and including isolation valves or flow restricting orifices contain Class 1 piping. The Class 1 piping in the attached systems penetrates the reactor coolant pressure boundary and extends up to and including any and all of the following as defined by Definitions 10 CFR 50.2.3:

- the outermost containment isolation valve in system piping which penetrates the primary reactor containment,
- the second of two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment,
- the RCS safety and relief valves.

The scope of the report includes passive components in the primary system piping (straight pipes, fittings, safe ends, nozzles and thermal sleeves) but no active components such as valves and pumps.

2) Significant ageing mechanisms

Six ageing mechanisms are discussed in the report that tend to reduce the life of the reactor coolant system piping components: thermal fatigue, vibrational fatigue, thermal ageing, primary water stress corrosion cracking, boric acid corrosion and atmospheric corrosion.
For each ageing mechanism, the related transients and operating environmental factors are discussed, the most susceptible sites are identified, the field experience is summarized, and related activities of regulators and the industry are summarized.

After discussion, the significant ageing degradation mechanisms and their susceptible sites were identified as shown in the following table.

Table 1. Significant ageing degradation mechanisms and their susceptible sites for the primary piping in PWRs

Ageing degradation mechanisms	Susceptible sites
Thermal fatigue	Surge line and nozzles Spray line and nozzles Other connected lines and nozzles Dissimilar welds between the main coolant piping and RPV
Vibratory fatigue	Small-diameter pipe lines
Thermal ageing	Cast stainless steel piping and welds
Primary water stress corrosion cracking	Alloy 600 instrumentation penetrations in the reactor coolant piping

3) Key factors to manage significant ageing mechanisms

Taking into account the operational experience and practices in Member States, the TECDOC-1361 provides guidance on dealing with the relevant age related degradation mechanisms. Some important examples are shown below:

a) Thermal fatigue

- Attention on the specific design (i.e. layout) of the piping system which may promote thermal stratification, thermal striping, and/or turbulent penetration;
- Effective local leakage detection techniques and thermal fatigue monitoring systems (e.g. local thermocouple matrices arranged azimuthally on the piping OD);
- Use of enhanced inspection and monitoring techniques to supplement the qualified techniques.

b) Vibratory fatigue

- Particular attention to monitoring during startup and shutdown operations;
- Visual inspection and radiographic testing to detect cracking at susceptible locations.

c) Thermal ageing

- Replication of the surfaces of the affected area for metallographic examination (to determine (delta)-ferrite content);
- Ageing surveillance specimens from the affected (or similar) materials to monitor the progression of the thermal ageing degradation;
- Volumetric examination of affected locations (possibly).

d) PWSCC

- Development of the in-service inspection programme for the Alloy 600 penetration and Alloy 182 dissimilar metal weld which uses ultrasonic and/or eddy-current technologies;
- External visual inspection for boron salt deposits and local leakage monitoring for those Alloy 600 penetrations deemed most susceptible to PWSCC.

e) Boric acid corrosion

- Adequate monitoring procedures to detect boric acid leakage before it results in significant degradation of the reactor coolant pressure boundary, such as wastage of carbon steel and low-alloy steel base metal;
- Visual examination during surveillance walk-down inspections as required by the USNRC Generic Letter 88-05.

(2) BWR RPV and Core Internals

Recently Inter Granular Stress Corrosion Cracking (IGSCC) of the RPV and core internals is a common significant problem among BWRs in Member States. To effectively manage IGSCC and other significant ageing mechanisms is an important issue for BWR owners. In this regard the Agency has created new component specific guidelines [16, 17] for BWR RPV and core internals. They are currently under publication process and will be published in 2005.

1) Scope

These new guidelines covers ageing management of the Reactor Pressure Vessel and Core Internals used in the all types of Boiling Water Reactors, they are:

- GE BWR Product Lines
- Japanese BWRs including ABWRs
- Siemens (Framatome ANP) BWRs
- ABB (Westinghouse AB) BWRs

Since not all Core Internal components are important to safety, the guideline classified them from safety point of view. Then ageing degradations and management of ageing of the Core Internals defined as important to safety were discussed into detail.

2) Significant ageing mechanisms

IGSCC is a common significant ageing mechanism for components of the RPV and Core Internals which are made of austenitic stainless steel. The guideline also describes recent operational experience on IGSCC of components made of nuclear grade stainless steel and Alloy 182 welds. In case of IGSCC on nuclear grade stainless steel, surface hardening caused by grinding and machining plays a important role for crack initiation.

Some Core Internals such as top guide, core shroud and core plate received high neutron flux, Irradiated Assisted Stress Corrosion Cracking (IASCC) is significant for these components. In addition fatigue is a significant ageing mechanism for CRD housing, Jet pump and shroud support.

For the RPV, fatigue of some components such as Closure Studs, Feedwater Nozzle are also defined as significant ageing mechanisms.

3) Key factors to manage significant ageing mechanisms

For IGSCC and IASCC, the followings are key factors to manage these ageing mechanisms:

- Water chemistry including Hydrogen Water Chemistry and Noble Metal Chemical Addition (NMCA);
- Material composition and fabrication review and fluence mapping;
- Utilization of databases that contain data on the effect of irradiation on the susceptibility of reactor internal materials to stress corrosion cracking (including modes of cracking, materials composition, and fluence/dpa level);
- Periodic in-service inspection performed on the basis of the data given in such database.

The guidelines also introduces surface treatment technologies such as Residual Stress Improvement by Peening and Laser De-sensitization Treatment as one of mitigation methods.

It is worthy to note that there were different opinions about NMCA mainly from US experts and European experts. After discussion, it was agreed to describe in the guidelines that:

- During operation there is a depletion of noble metal from reactor internal and piping surfaces. Consequently, every 3 to 5 years a re-application of NMCA is necessary;
- The demonstration of effectiveness to mitigate crack propagation using in-reactor UT crack size measurements is on-going.

For fatigue of CRD housing, Jet pump, shroud support and RPV components the followings are key factors:

- Transient monitoring to obtain more accurate estimates of both the total number of cycles and the stress ranges;
- Review of past operating records to determine the number and type of transients prior to the installation of the monitors;
- Sampling of flaws, if detected.

(3) PWR RPV and Core Internals

The current component specific guidelines for PWR RPV and Core Internals (TECDOC 1119 and 1120) document ageing assessment and management practices for PWR RPVs and Core Internals that were current at the time of its finalization in 1997-1998. Safety significant operating events that have occurred since that time, e.g. involving PWSCC of Alloy 600 CRDM penetrations, boric acid corrosion/wastage of RPV head and IASCC of baffle-former bolts, threatened the integrity of the RPV heads and core internals involved. These events led to new ageing management actions by both NPP operators and regulators. In this regard, the Agency decided to create TECDOC addendums to update relevant sections of the existing TECDOC-1119 and 1120 in order to provide current ageing management guidance for PWR RPVs and Core Internals to all involved in the operation and regulation of PWRs and thus to help ensure integrity of PWR RPV and Core Internals in IAEA Member States throughout their entire service life.

1) Scope

TECDOC-1119 and 1120 and their addendums cover Ageing Management of the RPV and Core Internals of Western PWRs designed and manufactured by Westinghouse, Combustion Engineering, Babcock & Wilcox, Mitsubishi, Framatome and Siemense/ KWU and those of WWER-440 and WWER-1000.

2) New significant ageing mechanisms

TECDOC-1120 defined only Radiation Embrittlement of Shell (Core Region) as a significant ageing mechanism. The draft addendum of TECDOC-1120 added PWSCC of Alloy 600 components and Alloy 182 welds and Boric Acid Corrosion of the top head as new significant ageing mechanisms. The following sites are susceptible to PWSCC:

- CRDM nozzles;
- Bottom-mounted instrumentation nozzles;
- Nozzle safe ends;
- Other locations (Cladding of nozzle bore, Radial keys).

TECDOC-1119 recognized Radiation Embrittlement, Stress Corrosion Crocking (IGSCC, TGSCC, IASCC) and Fatigue (for some bolts and pins) as significant ageing mechanisms. The draft addendum of TECDOC-1119 added recent operational experience of IASCC of baffle former bolts.

3) Key factors to manage significant ageing degradation mechanisms

The draft TECDOC-1120 addendum describes the following factors to manage PWSCC of Alloy 600 components and Boric Acid Corrosion :

a) PWSCC of Alloy 600

- ISI programmes for the Alloy-600 penetrations to ensure timely detection of any Alloy-600 penetration cracking, which include NDE appropriate to the susceptibility of a specific RPV head to PWSCC as well as bare metal visual examination of 100% of the head surface;

- Preparation of a flaw evaluation handbook and development and documenting of plant-specific criteria in a flaw evaluation handbook.

b) Boric Acid Corrosion

- Visual inspections performed during each refuelling outage to identify potential boric acid leaks from not only the Alloy 600 penetrations but also from pressure retaining components above RPV head;
- Determination of the wastage level of affected ferritic steel components, once a boric acid leak is detected.

In addition the TECDOC 1120 addendum introduces environmental fatigue assessment methods in USA and Japan and updated radiation embrittlement assessment methods in USA, France and for WWERs.

The draft TECDOC-1119 addendum provides the key factors to manage IASCC of baffle-former bolts shown below:

- Ssubdivision of NPPs according to susceptibility of their baffle former bolts to IASCC. Bolt damage prediction equations/curves that take into account fluence, temperature, stress as well as operating experience could be useful for this task.
- Development of baffle former bolts inspection programme for the lead NPPs. Perform UT examination of baffle former bolts of the lead plants.
- Develop baffle former bolts inspection programme for NPPs with lower IASCC susceptibility on the basis of inspection results from the lead NPPs.

The addendum also introduced an example of IASCC damage prediction equation developed in Japan.

4. EBP SALTO

Decisions on long term operation (LTO) involve the consideration of a number of factors. While many of these decisions concern economic viability, all are grounded in the premise of maintaining plant safety. It was recognized that internationally agreed-upon, comprehensive guidance was needed to assist regulators and operators in dealing with the unique challenges associated with the LTO issue.

Therefore, the Agency initiated the Extrabudgetary Programme (Programme) on ‘Safety aspects of long term operation of water moderated reactors’ (SALTO) in 2003. The Programme’s objective is to establish guidance on the scope and content of activities to ensure safe long term operation of water moderated reactors.

The Programme Steering Committee, composed of senior representatives from the participating Member States (Bulgaria, Czech Republic, Finland, France, Germany, Hungary, Russia, Slovak Republic, Spain, Sweden, Ukraine, United Kingdom, the USA, European Commission and WANO), guides the Programme efforts implemented through 4 Working Groups dedicated to specific technical areas.

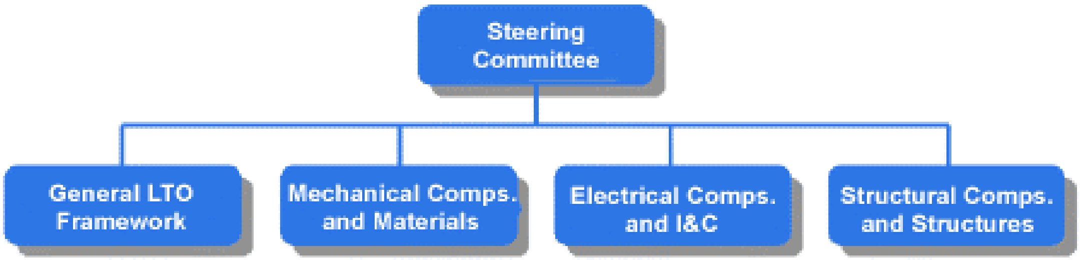

Fig. 2. Programme structure.

The Programme's objectives include developing guidelines to assist regulators and operators of water moderated reactors, in assuring that the required safety level of their plants is maintained during long term operation. The Programme will also provide generic tools to support the identification of safety criteria and practices at the national level applicable to LTO, and will serve as a forum in which Member States can freely exchange information and experience. The combined experience of all Member States participating in this Programme will be used as an input to developing an optimal approach to safe LTO.

The Programme final outcome, the report 'Recommendations on the Scope and Content of Programmes for Safe Long Term Operation of Water Moderated Reactors' will provide an overall guidance in this area. Further, the EBP will provide detailed guidance in the areas of general LTO framework, mechanical components and materials, electrical components and I&C, structural components and structures as well as a database of LTO related technical information.

The Programme final outcome will be based on a concerted effort, conducted in several steps:

- collect available information from participating MS;
- review and compare the information collected, evaluate and document common elements and the differences;
- reconcile the differences and identify future challenges;
- consolidate the information available and develop guidelines.

The Programme will be completed in the end of 2006 and related activities transferred to the IAEA regular programme.

Detailed information on the Programme could be obtained on its dedicated web pages: http://www-ns.iaea.org/projects/salto. In particular, information on the Programme objective, scope, structure, schedule, members is provided there. All finalized documents prepared within the Programme could be also downloaded from the web pages.

5. Other activities related to LTO

(1) Periodic Safety Review (PSR)

Periodic safety review (PSR) is an effective means of ensuring the long term safety of nuclear power plants (NPPs) which is an integral part of NPP life management and a prerequisite for plant life extension. PSR is a comprehensive safety review addressing all important aspects of NPP safety which is carried out at ten year intervals to obtain an overall view of actual plant safety and to identify changes that should be made to maintain a high level of safety.

Since the publication in 1994 of the first version of an IAEA Safety Guide on Periodic Safety Review of Operational Nuclear Power Plants, the number of countries using and intending to use PSR has been increasing and significant experience in implementation of PSR has been accumulated. The IAEA has compiled this experience and revised the Safety Guide on PSR [19] in 2003 using this experience. Currently the Agency is intended to further revise the safety guide to incorporate neccesary considerations for subsequent reviews after the first PSR.

In addition the Agency is preparing the following guidance documents on PSR to supplement the safety Guide:

1) TECDOC on “Experience of Member States in implementing periodic safety review of NPPs”;

2) Training Materials on PSR for training courses under TC projects;

3) New TECDOC on the “Role of the PSR, updating FSAR, DBD and CM in the plant safety”.

(2) Design Basis Management

The design basis for SSCs is the information that identifies the specific functions to be performed and the controlling design parameters and specific values or ranges of values for these parameters. The design bases stipulate the function of the SSCs, essential SSC parameters of the stated functions and processes, the basic safety margins to be included in the design, accident and fault scenario expectations, environmental considerations and applicability of safety and industry codes and standards. The design basis of NPPs is used by the plant staff and the regulatory authority in judging the acceptability of the original design and of modifications to the NPP with respect to the safety of the NPP’s personnel, public and environment.

As a pilot project, the Agency has drafted a “Guideline for Design Basis Documents (DBD) Collation and Maintenance for WWER Reactors” and is providing assistance in this area through training and the exchange of experience. In the next step, this Guideline will be generalized to be applicable to all reactor types.

To initiate efforts to consolidate the design basis documentation is particularly important for LTO of older plants. Older plants may require a number of modifications to meet current safety requirements, for which the likelihood that the original designer/vendor may not be able to provide the needed support is highest, and, which for technical, organizational or other reasons do not have this information available.

(3) Configuration Management

Configuration management (CM) is the process of identifying and documenting the characteristics of a facility's SSCs and of ensuring that changes to these characteristics are properly developed, assessed, approved, issued, implemented, verified, recorded and incorporated into the facility documentation [20]. The main challenges are caused particularly by ageing plant technology, plant modifications, the application of new safety and operational requirements, and in general by human factors arising from plant personnel turnover and possible human failures. The IAEA Incident Reporting System shows that on average 25% of recorded events could have been caused by configuration management errors or deficiencies. Correctly applied, CM processes ensure that the construction, operation, maintenance and testing of a physical facility are in accordance with design requirements as expressed in the design documentation. An important objective of a configuration management program is to ensure that accurate information consistent with the physical and operational characteristics of the nuclear installations is available in a timely manner for making safe, knowledgeable, and cost effective decisions with confidence, including decisions on LTO. CM is another important element of maintaining plant safety and adequate safety margins during LTO.

The Agency is preparing a safety report on the "Application of Configuration Management in Nuclear Power Plants ", which focuses also on examples of events, challenges to CM and good practices.

IAEA is running a European regional project on the "Improvement of Design Basis Documentation and Configuration Management" (2005 – 2006) to improve the understanding of the need for and the expected content of Documentation of the Design Basis of NPPs and the interaction between the design basis documentation management, configuration management and the safety and operation of the NPP.

6. Knowledge Management: SKALTO

The Agency developed a Safety Knowledge Base on Ageing and Long Term Operation (SKALTO) of NPPs as a pilot project and a first practical application of knowledge management techniques in the Department of Nuclear Safety and Security. The IAEA guidance documents on Ageing Management provide the core for SKALTO's knowledge inventory.

The objective and goal of SKALTO is to identify and store relevant knowledge (or provide links to relevant knowledge sites) in order to facilitate its retrieval, updating, extension and dissemination to potential users and thus to promote more creative and effective ageing management and LTO programmes and activities. The scope of SKALTO covers:

- management of physical ageing of nuclear plant SSCs important to safety; and

- other LTO programmes, such as periodic safety review (PSR), configuration management (CM), and design basis data management (DBDM).

SKALTO consists of the following chapters:

(1) Nuclear Safety Standards and Guides
(2) Basic Knowledge and Guidanc
(3) Relevant Safety Activities
(4) Safety Research and Development
(5) Education and Training
(6) Experts
(7) Links to other organization's insights
(8) Links to relevant IAEA Data Base

Chapter 1 provides relevant IAEA safety standards and INSAG reports, national requirements such as US NRC NUREG 1800 (Standard Review Plan for Licensing Renewal) and recommendations of other international organizations such as OECD/NEA and EC. Chapter 2 provides terminology and abbreviations, key reference documents such as US NRC "GALL Report" and IAEA guidance documents. Chapter 3 provides past records of IAEA missions and meetings. Chapter 4 consists of reports of IAEA Coordination Research Programmes (CRPs) and other national/ international research programmes. Section 5 provides standard training modules on Ageing Management and Equipment Qualification. Chapter 6 is a yellow page of experts. Chapter 7 and 8 have links to web pages of other organizations and to relevant IAEA data-base.

SKALTO users can get actual documents and materials or jump to other sites by clicking links on SKALTO HTML pages.

Since SKALTO is under development, it is currently carried on only the IAEA intranet. However the reduced scope SKALTO that includes open documents could be accessed on: http://www-ns.iaea.org/projects/salto.

The expanded scope version will be accessible in 2005.

7. Future direction of IAEA activities on Ageing Management

(1) Safety Guides

As mentioned in Session 1 of this paper, a comprehensive set of guidance documents on ageing management for nuclear power plants (NPPs) has been produced by the Agency. These guidelines are, in general, applicable to all nuclear reactors. They represent a large volume of technical guidance. The Agency has initiated the preparation of higher level documents, i.e. Safety Guides with references to the exiting guidelines for 'how to' details as well as to other related Safety Guides.

(2) Further expansion and updating of guidance documents

Most of the programmatic guideline and components specific guideline documents were published in 1990s. Member States have been accumulating operational experience and practices related to component ageing degradations and ageing management programmes after publication of these guidance documents. In this regard it is important to keep them up-to-date and add new important guidance documents. The Agency puts priorities on the following subjects:

(1) Programmatic Guideline
- Publication of Proactive Ageing Management (new document)
- Updating of the AMP methodology (Technical Reports Series No. 388)

(2) Component Specific Guideline
- Updating of the guideline for Steam Generators
- Updating of the guideline for CANDU pressure tubes
- Updating of the guideline for CANDU reactor assembly
- New guideline for Pressurizers

(3) Maintenance of SKALTO

It is also quite important to keep SKALTO up-to-date and further expand its contents. Since the current version of SKALTO mainly focuses on the Agency's documents, there are rooms to further incorporate requirements, code and standards, guidance documents and research programme outputs prepared by Member States and other international organizations.

The Agency also plans to modify SKALTO structure and to further focus on ensuring the qualify of the information and on improving the classification of the information and enhancing the user friendliness.

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