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EXTRABUDGETARY PROGRAMME ON SAFETY ASPECTS OF LONG TERM OPERATION OF WATER MODERATED REACTORS

MINUTES OF THE PROGRAMME'S WORKING GROUP 4 THIRD MEETING

17-19 May 2005
IAEA, Vienna, Austria

INTERNATIONAL ATOMIC ENERGY AGENCY

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0. INTRODUCTION

The number of Member States giving high priority to extending the operation of nuclear power plants beyond their initial license is increasing. 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. The IAEA recognized this new industry initiative; therefore, in the 1990's, it developed comprehensive generic guidance on how to manage the safety aspects of physical ageing. It was recognized, however, that internationally agreed-upon, comprehensive guidance was needed to assist regulators and operators in dealing with the unique challenges associated with the LTO issue.

In response, the IAEA initiated this Extrabudgetary Programme (Programme) on 'Safety aspects of long term operation of water moderated reactors' (original title was 'Safety aspects of long term operation of pressurized water reactors'). The Programme's objective is to establish recommendations on the scope and content of activities to ensure safe long-term operation of water moderated reactors. The Programme should assist regulators and operators of water moderated reactors, and, in particular WWERs, in ensuring that the required safety level of their plants is maintained during long term operation, should provide generic tools to support the identification of safety criteria and practices at the national level applicable to LTO, and should provide a forum in which MS can freely exchange information.

The Programme activities are guided by the Programme Steering Committee (SC), follow the overall SC Programme Workplan and SC Terms of Reference, [1,2], and are implemented in 4 Working Groups (WG). The WGs focus on:

- General LTO framework (WG 1);
- Mechanical components and materials (WG 2);
- Electrical components and I&C (WG 3);
- Structures and structural components (WG 4).

Further detailed information on the Programme could be found at: http://www-ns.iaea.org/nusafe/s_projects/salto_int.htm.

The 3rd meeting of WG 4 was held at the IAEA in Vienna, 17-19 May 2005. The objectives of the 3rd meeting of WG 4 were the following:
- Review of Task 2 (data comparison) results based on the CIRs;
- Planning of Task 3 (finalization of the Final Report of WG4);
- Assign review action items (develop/agree review plan).

The Agenda for the Meeting is provided in Appendix I. The list of participants is provided in Appendix II.

1. MEETING SUMMARY

The meeting was opened by Mr. Paolo Contri, Scientific Secretary for WG 4 who outlined the objectives of the meeting and summarized the outcome of the previous tasks. The Chairmanship was then turned over to Mr. Katona, the WG 4 Chairman, who clarified the meeting agenda, briefed the WG4 on the conclusions of the Steering Committee held in April 2005, and proposed a series of improvements to the currently available draft of the Final Report of the WG4.

Presentations by each country summarized the information contained in the Country Information Reports (CIRs) and provided a first group of comments to the draft Final Report, proposing a course of action for the Task 3 activities to be completed by November 2005, as asked by the SC on April 25-28 [1].

2.1 IAEA and national presentations

Mr. Contri summarized objectives and scope of the activity of the WG, in the framework of the overall project objectives and identified the specific objectives of the meeting (namely, review the CIRs, and definition of the Task 3 course of actions).

Mr.Katona summarized the main conclusions from the SC relevant to the WG-4 activity.
In detail, the following SC recommendations were discussed:

- Pre-conditions for LTO: Examples could be availability for current licensing basis and updated FSAR. WG-1 was assigned the lead responsibility for this task;
- Scoping criteria for LTO - based on WG1 - 4 presentations, the SC concluded the definitions of scoping and the criteria as applied to LTO should be clearly defined. –WG-1 was assigned this task. –WG 2 - 4 were asked to prepare a scoping process diagram for use in scoping of SSCs for LTO. –WG2 - 4 L/S presented a proposed process diagram for the SC comments;Attributes for acceptable programs that ensure SSCs are capable of performing their function during the period of LTO;
- WG-1 to prepare a list of attributes. Existing plants programs and maintenance practices can then be compared against the attributes to determine if acceptability of current programs for LTO;Common table for aging management review - as part of preparation of the final report, WG2 - 4 L/S agreed to propose a table format containing material, environment, aging effect/ mechanism information which could be quite useful for aging management review. A proposed table was provided to the SC for comments;
- Definition of LTO: the SC tasked WGs 2 - 4 to propose a clear definition of LTO for inclusion in WG-1 report. The proposed definitions are:
    - Operation beyond an established timeframe (license, design, etc.), which was derived considering life limiting processes and features for SSCs after providing a technical basis for operation that confirms that the initial assumptions used to justify safe plant operation will be maintained for the period of extended operation (Tom Taylor);
    - Operation beyond maximum term set forth by the national documentation (license, design, standards, regulations, etc.); possibility of such operation is confirmed by a set of activities aimed at justification of safety of such operation (Nikolai Sorokin);
    - WGs Final Reports outlines: the SC tasked WG 2 - 4 to finalize the outlines including tables, and ensure that they are uniform and consistent;

- The SC directed WGs 1 - 4 L/S to ensure that the WGs Final Reports focuse only on LTO specific issues. Information related to normal operations which some CIRs may contain, should be excluded;
- The SC directed WG 1 - 4 L/S that if a specific CIR is missing some information and it is needed for the final report, it should be requested on a country-specific basis only;
- No general revisions to any CIR should be requested;
- The SC decided that CIRs will remain restricted because they may be incomplete and not truly represent a complete picture of country practice. Any requests will be referred to the respective country expert;
- The SC agreed that the recommendations made by the WGs in the Programme Final Report and as commented and approved by the SC, the Agency could use the information in part, or as a whole, as appropriate in a Safety Guide or other Agency documents.
- **The SC also agreed that all draft WGs Final Reports shall be submitted to Mr. R. Havel by December 5, 2005;**
- **The next Steering Committee Meeting is tentatively scheduled for the week of January 23, 2006;**
- Based on the discussion during the SC meeting, the WG leaders and secretaries revised the schedule for the remaining Programme time until its completion,

The meeting continued with the presentation of the comments to the Final Report by all participants.

The summaries of the national presentations are provided in the following, while the complete presentation handouts are provided in Appendix IV.

Bulgaria (S. Danailov, M. Batischev)

A. Working approach – Chapter 4.0.

The task, which the Bulgarian team had to perform, was to prepare a review of Chapter 4. and a Compilation of a list of reference documents, from which the information in CIR-s was collected.

The list that we constructed contains a large amount of documents' titles, which are non-related to LTO. We reviewed all CIR-s and prepared the compilation of the reference documents, from which the information was collected. The aforementioned compilation is included in the FR-draft and the international documents are underlined. We believe that the review-table, proposed in Appendix IV, page 30 of LTO 03 "Standard Review Process" /SRP/ is not applicable for the reference documentation. For this reason, the results from the review of the information in the point 4 are placed in a different table, which is included in the FR.

We must note that the classification of the reference documents is performed only by their titles, since we are not familiar with the documents in details. Only some of the documents' titles are known for us.

The conclusion is that only in American CIR, national related to LTO documents are mentioned. International documents related to LTO, are not available.

B. Comments on the FR-draft.

1. The text in chapter 2.2. on page 15, section A., "Common elements" is not quite accurate. In KNPP, a system for timely detecting, assessment, classification and treatment of the arising defects is in implementation. The procedure is described in chapter 3.2. of the Bulgarian CIR.

2. We believe that the text in section B., "Different elements": "Bulgaria currently has no specific AMP-s to ensure plant containment structural integrity" has to be replaced.

An original Russian instruction for containment integrity control and maintenance is in implementation during the period of operation. According to the instruction, after the construction of the containment, initial testing under pressure about 3 bars, is to be carried out. In every outage in the operation period, integrity control is performed. At first, a preliminary control with vacuum is completed. If any leakage is detected, it is repaired. After that, the main testing with pressurizing to 0.7 bars is applied. After the stabilization of the pressure and the temperature, the total value of the containment leakage is measured. It should not exceed 0.3% the internal volume of the containment.

In the scope of the Modernization program, a new additional system for containment integrity control is installed. The new system gives faster and more exact results than the existing one. The implemented method is based on a very precise control of the difference between internal and external containment pressure. After the new system is licensed, we will start to operate simultaneously with both of the control systems. The trend is that the new integrity control system replaces the existing one in future operations.

These activities are mentioned in chapter 1.5.2. of the Bulgarian CIR.

3. The text in the same section, C., "Summary of Topic 2.2." – "the focus of the Bulgarian programs appears to be mostly geared on modernization and very few activities are for management of aging effects" is not exact.

It is true that the AMP and the Internal Life-Time Assurance Program for Units 3&4 were developed in the scope of the Modernization program. In spite of this, AMP and ILTAP operate as independent programs. In the scope of the civil structures, these programs provide actions for analysis of the reasons of arise of defects, repair of defects and monitoring system optimization.

In separated cases it is possible to combine modernization and ageing management activities. For example, the simultaneous execution of seismic upgrading and repair of the existing defects in the Turbine Halls of Units 5&6 is planed. In principle, repair and modernization activities are planned, organized and realized independently, by different programs.

Of course, the modernization aims to satisfy the new normative and operation requirements, but it does not intend to manage any aging effects.

4. It is fully possible that the CIR information is not focused on the most important questions from LTO point of view. If it is necessary, additional information may be provided. For instance, the FR from the performed full-scale dynamic test of Reactor building and Diesel generator station of Unit 5 through an underground explosion is available.

C. Additional information.

In the next 2006 year the replacement of Containment Pre-Stressing System /CPSS/ of Units 5&6 will be completed. Along with the new pre-stressing system an additional Automatic Monitoring System for the Tendons Stressing Forces /AMSTSF/ is installed for real-time control of the forces in bundles /tendons/. The both new systems are patented, licensed and tested.

Full-scale testing of both of the systems /CPSS and AMSTSF/ is performed simultaneously. Stressing force of 1200 tons was reached. During the test three independent control methods are used: 1. electronic signal from new AMSTSF; 2. permanent control of the pressure in the hydraulic system and 3. direct control of the force of one from the four jack pistons.

Maximal stressing force 1200 tons of the test tendon is reached and held for 3 months. In this period loss of the stressing force or any damage of the anchorage elements were not detected.

Every of new type tendons is anchored at design pre-stressing force – 1000 tons. The test and operation results show very high reliability of the new CPSS and insignificant loss of stressing force. After the full replacement of the Containment Pre-Stressing System at Units 5&6 is completed, the problem with the loss of stressing force and failure of tendons will be finally solved.

For this reason, the loss of stressing force in CPSS as a type of degradation mechanism is not described in details in the Bulgarian CIR.

Czech Republic (J. Maly)

Brief information has been provided on the results of WG4 – task 2 solution. Czech Republic is leader of review group 3 and sections 3.2; 3.3; 3.4 of CIR were reviewed. First draft of WG4 Final Report prepared by members of review group 3 has also been presented. Review of CIRs was carried out according to IAEA-EBP-LTO-03: SRP, which gives guidance for conducting the reviews. Each chapter of the Final Report starts with brief summary of national approaches in individual member states. Presentation was focused namely to the identification of common elements and differences in MS operational practices as well as to the recommendations for regulatory approaches and necessary future development.
In case of MS & I practice, condition monitoring of non accessible parts is the general problem and development of technical tools capable to reveal some types of hidden defects has been recommended.
Information provided by each MS in chapters related to maintenance practice and repair technology is not too balanced in CIRs. However the common elements in all member states is to emphasize the need for accurate determination of primary reason for defects and material degradation. The repair technology is subjected to fast development and also material assortment available in the market changes very quickly. The area of the operating maintenance is usually well covered in the procedures for the NPP operators.
All the member states provided minimum information in chapters related to assessment techniques for existing structures and trend analyses. However this area is very difficult and many issues have been identified where additional development may be necessary.
Czech Republic is ready to complete updated draft of WG4 Final Report according to time schedule agreed at the meeting.

Hungary (T. Katona)

A very detailed proposal was given on the conduct of the meeting itself and some specific comments were issued in relation to the chapters of the Final Report, as in the following:

Regulatory References

- Some countries developed detailed regulations specific to structures in relation to LTO. Some countries have generic requirements, regulations (or a few structure specific). It depends on the conditions in country and stage of LTO development;
- Industrial programmes might be developed and successful in both cases;
- Information transfer is very important (from those countries, where the LTO in progress and lot of experience collected, detailed regulations, rules and standards developed);
- Therefore the IAEA has to use the effort of SALTO in the development of LTO related guidelines and documents.

LTO Scope

- In the majority of countries the scope selection is based on safety classification (in line with former IAEA guideline). In some cases seismic classification is also taken into account;
- Clear rules for definition of the scope of LR are needed;
- The countries agreed upon the scope of structures relevant to LTO and accept the rules given by April 2005 SC Meeting;
- The identification of structural components relevant to LTO is varying country to country (most of them are not mentioned or included into the scope of other areas (mechanical, electrical);
- More attention has to be paid to correct identification of structural components within the scope.

Reference Degradation Mechanisms

- There is an agreement between the countries concerning the main degradation mechanisms of structures;
- The differences are caused by differences in scope (what is included) and stage of development of LTO;
- The presentation of the country practices is not uniform, but the main content is overlapping.

Monitoring, Surveillance and Inspections

- The main degradation mechanisms of structures are covered by adequate programmes;
- The differences are caused by differences in scope (what is included) and stage of development of LTO;
- The presentation of the country practices are not uniform, but the main content is overlapping;
- Examples for best practices can be extracted from country reports (e.g. well structured approach of Slovakia and Czech Rep., control of building settlement in Hungary, well established LR approach in the US);
- Programmes for the structural components (not indicated in CIRs, but within the LTO scope) have to be developed.

Maintenance practice

- Ageing mitigation measures and maintenance technologies exists for the main degradation mechanisms of structures;
- The differences are caused by differences in scope (what is included) and stage of development of LTO;
- The presentation of the country practices are not uniform, but the main content is overlapping;

- Examples for best practices can be extracted from country reports (e.g. measures for decreasing containment leakage of Slovakia);
- Programmes for the structural components (not indicated in CIRs, but within the LTO scope) have to be developed.

Assessment techniques for existing structures

- Assessment techniques exists for the main degradation mechanisms of structures;
- The differences are caused by differences in scope (what is included) and stage of development of LTO;
- Examples for best practices can be extracted from country reports (e.g. assessment of containment performance of Slovakia, or assessment of the settlement in Hungary);
- Methods and criteria for the structural components (not indicated in CIRs, but within the LTO scope) have to be developed;
- The information transfer between countries might have an essential role
- Some R/D activities could be identified (try to define).

References

- Compilation of a list of reference documents from which the above information was collected;
- Message;
- The lists given in CIRs are different in details;
- No need for extension of the lists;
- The given lists have to be filtered;
- Only the LTO relevant references specific to structures have to be indicated;
- List could be presented not country by country but per type, i.e. WWER-440, WWER-1000, PWR (like examples of best references).

Russian Federation (E. Zakharov and N. Korobov)

Very detailed comments were issued on the scoping procedures. Many proposals for summary tables of systems and components to be included in the LTO scope were developed and discussed.

Slovak Republic (SR) (M. Prandorfy and D. Benacka)

Very detailed comments were issued on the draft final report. Many proposals for summary tables of systems and components to be included in the LTO scope and degradation mechanisms were developed and discussed.

Sweden (J. Gustavsson)

The following comments on the draft Final Report were issued by the Swedish representative:

- There were some difficulties in comparing the CIRS. Some countries have not followed the agreed structure of the report.

- Ageing managements programs
  The focus in the different countries is quite varying. In some countries the focus was licence renewal, modernization or ageing management programs. The regulatory situation differs from very detailed regulation to only comprehensive regulation

  The responsibility for the ageing management is centralized in some countries while in other countries it is decentralized.

- Degrading mechanisms

In all of the CIRs reference-degrading mechanisms are presented and well described. In some reports there were very many mechanisms even those mechanisms that are not relevant for LTO. In other reports few degrading mechanisms are chosen and some of the degrading mechanisms important for LTO are missing.

Ukraine (O. Mayboroda and M. Semenyuk)

In the Ukrainian presentation the following issues were described:
- Updating of the CIR;
- Generalisation of Part 1 of CIRs «Applicable laws specific to Structures and Structural components for long term operation»;
- Review of 1-st version of WG-4 final report;
- Proposals on Final WG-4 report preparation.

  The information on new regulatory guide "General requirements on the extension of NPP operation beyond its design lifetime based on the results of PSR" NP 306.2/099-2004 was included in CIR. This regulation firstly in Ukraine incorporates requirements to NPP's unit ageing management program.

  Results of generalisation of Part 1 of CIRs "Applicable laws specific to Structures and Structural components for long term operation» were presented as brief overview of acting in countries legislation and regulatory requirements that regulate general issues connected with SSCs LTO: license renewal (extension); safety analysis and periodic safety review; safety classification and categorisation; ageing management programs.

  The following general comments to 1st draft FR were made:
- In items 2.2 and 3.1 of WG-4 final report 1st version only three countries (Bulgaria, Russian Federation and Slovak Republic) information were compared. But in Tables 2.2 and 3.1 all countries information were generalised;
- Ukrainian CIR data on items 3.2, 3.3 and 3.4 were not considered in WG-4 final report 1st version.

The presentation also included comments to tables 2.2 and 3.1 as well as proposals on Chapter 1 FR preparation.

USA (R. Auluck)

The U.S. presentation included status of current activities related to license renewal in the U.S. Thirty nuclear power units have already received renewed licenses extending their operation by additional twenty years. At present, eighteen units are under the NRC review. In the U.S., the license renewal process is continuously changing with improvements in the quality of applications for license renewal and in the efficiency and consistency in the NRC review of these license renewal applications. In January 2005, the NRC issued the draft revisions to the following guidance documents for public comment:

- Draft Standard Review Plan, Rev. 1;
- Draft Generic Aging Lessons Learned (GALL) Report, Rev. 1;
- Draft Regulatory Guide, DG-1140;
- Draft Bases Document for Revisions to GALL Report, Rev. 1 and SRP Rev. 1;

- License Renewal Inspection Manual;
- Inspection Procedure – 71002;
- Inspection Procedure – 71003.

These draft revisions reflect the new NRC review process, and lessons learned from reviewing previous license renewal applications. These include new aging management programs in the electrical area and incorporation of NRC staff positions reflected in the interim staff guidance (ISG) documents. Additional guidance has been added on how aging management reviews are to be conducted by the NRC staff. In the GALL report, several line items have been combined and cross-references added, and thus making these tables more user-friendly. The final revisions to all these documents are expected to be issued by September 30, 2005.

In January 2005, Nuclear Energy Institute (NEI) also issued draft revision to NEI 95-10, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54." This document prepared by the industry group is very useful and provides detail guidance to licensees in preparing an application for license renewal.

The information contained in the country information report (CIR) summary sections is very useful. These sections should be updated, if needed, to reflect complete and correct information. Additional information could be added regarding attributes of an acceptable aging management program. As summarized by the Chairman, Steering Committee (SC) recommendations should be incorporated in the WG-4 final report. In addition, the work should be coordinated with other WGs for a uniform and consistent final report.

European Commission (C. Rieg)

No new presentation was provided. Reference was made to the presentation provided last WG4 meeting. Very detailed comments were issued on the draft final report. Many proposals for summary tables of systems and components to be included in the LTO scope and degradation mechanisms were developed and discussed.

1. DISCUSSION OUTCOMES

3.1 Comments on the draft Final Report

<u>Chapter 1 (Regulations)</u>

The following has been decided:

- The chapter is kept. However, it has to be shortened in order to include only regulations on structures and LTO;
- The differences among the country practices should be highlighted;
- The need for minimum regulations in the field of LTO should be identified.

<u>Chapter 2.1 (Scope of LTO)</u>

The following has been decided:

- The chapter should be rearranged in different subchapters: PWR&BWR, WWER440, WWER1000;
- The functions challenged by the LTO should be clearly identified;
- Commodity groups should be used whenever possible.

The meeting reminded that the scope of the WG 4 was defined in 2004 in the LTO-07 [4]. It should include the following items:

0. Containment/confinement/pressure boundary structure;
0. Structures inside the pressure boundary (compartment box, reactor box);
0. Other safety classified buildings;
0. Radwaste bldg.;
0. Spent fuel pool;
0. Water intake structures;
0. Foundation systems (turbine, others), embedment, soil-structure interaction issues;
0. Stack;
0. Cooling towers;
0. Buried pipelines;
0. Anchorages, penetrations, hatches, etc.;
0. Painting, coating, fire proof coating, etc.; and
0. Other structures where significant degradation has been recorded.

Chapter 2.2 (Organisation of AMP)

The following has been decided:

- The interfaces between AMP and LTO should be clearly identified, also with reference to the IAEA Safety Report n.15 (which is much broader in scope, as it addresses the whole AMP).

Chapter 3.1+3.2+3.3+3.4 (Degradation mechanisms, MS&I, assessment)

The following has been decided:

- Two tables should be developed with the LTO significant mechanisms and the relevant MS&I practice;
- Reference should be made to the "best practice" among the Countries;
- Acceptance criteria should be explicitly addressed.

Chapter 4 (References)

The following has been decided:
The chapter should be reorganized as it is meaningless in the current form.

3.2 Agreed actions on the draft Final Report

Chapter 1 (Regulations)

The following has been agreed:
Subgroup 1 will review the draft FR taking the following issues into account:

- In the national guidelines on LTO identify and extract the statements addressing structures and components in the scope of the WG4;
- Develop recommendations on the need for minimum regulations in the field of LTO for the structures and the aspects to be covered (e.g., classification, scooping criteria, ISI, monitoring issues, etc.);
- Include the comments of the previous chapter;
- Develop new text for chapter 1 according to the previous "bullets" and integrate it with the existing draft. The section on "Recommendations" should be split into three parts, namely:

a) best practice suggested to the MS;
b) recommendations to the IAEA for future initiatives;
c) recommendations to the scientific community for further development and research needs.

(ACTION 1, by 10/7/2005)

Chapter 2.1 (Scope of LTO)

The following has been agreed.
Every Country will fill and review the proposed Tables 1 (see Appendix III), according to the following sharing scheme:

WWER1000	Russian Fed., Ukraine, Bulgaria
WWER440	Czech Rep., Slovakia, Hungary
BWR, PWR	Sweden, USA, EU

(ACTION 2, by 10/6/2005)

Subgroup 1 will review the draft FR taking the following issues into account:

- Revise the draft tables n.1 on LTO scope developed at the meeting. Make them consistent with both the scope of the WG4 and among them (i.e. same level of detail). The draft tables 1 are attached in Appendix III, but will be revised once more in action 2;
- Describe the rationale for the classification of items as "LTO relevant" and describe it clearly in the last column of the table 1;
- Revise the scoping flow chart proposed by the SC (see Appendix III) and include it in to the text;
- Include the comments of the previous chapter;
- Develop new text for chapter 2.1 according to the previous "bullets" and integrate it with the existing draft. The section on "Recommendations" should be split into three parts, namely:

a) best practice suggested to the MS;
b) recommendations to the IAEA for future initiatives;
c) recommendations to the scientific community for further development and research needs.

(ACTION 3, by 10/7/2005)

Chapter 2.2 (Organisation of AMP)

The following has been agreed:
Subgroup 2 will review the draft FR taking the following issues into account:

- Revise the text and incorporate comparison with the IAEA approach on AMP described in the Safety Report n.15;
- Include the comments of the previous chapter;
- Develop new text for chapter 2.2 according to the previous "bullets" and integrate it with the existing draft. The section on "Recommendations" should be split into three parts, namely:
  a) best practice suggested to the MS;
  b) recommendations to the IAEA for future initiatives;
  c) recommendations to the scientific community for further development and research needs.

(ACTION 4, by 10/7/2005)

Chapter 3.1 (Degradation mechanisms)

The following has been agreed:
Every Country will fill and review the proposed Table 2 (see appendix III) on degradation mechanisms, according to the following sharing scheme:

Pre-stressed Concrete Structures & Structural Components (including supports)
Russian Federation
Reinforced Concrete Structures & Structural Components (including supports)
USA
Steel Structures & Structural Components (including supports)
Czech Rep.
Specific materials (fire-resistant, sealings, etc)
Hungary
Organic liners, coatings and paintings
Hungary
Steel liners Slovakia

(ACTION 5, by 1/7/2005)

Subgroup 2 will review the draft FR taking the following issues into account:

- Incorporate the updated Table 2 (see above);
- Emphasis in Table 2 should be given to the life limiting mechanisms. Other mechanisms may be mentioned but with less detail;
- Include the comments of the previous chapter;
- Develop new text for chapter 3.1 according to the previous "bullets" and integrate it with the existing draft. The section on "Recommendations" should be split into three parts, namely:

a) best practice suggested to the MS; ;
b) recommendations to the IAEA for future initiatives;
c) recommendations to the scientific community for further development and research needs.

(ACTION 6, by 10/7/2005)

Chapter 3.2+3.3+3.4 (MS&I, assessment)

The following has been agreed.
Every Country will fill and review the proposed Table 3 (see appendix 4), according to the following sharing scheme:

WWER1000	Russian Fed., Ukraine, Bulgaria
WWER440	Czech Rep., Slovakia, Hungary
BWR, PWR	Sweden, USA, EU

In this work, the following has to be taken into account:
0. There are some important differences between Table 2 and 3, namely:
- In table 3 the degradation mechanisms and their locations are linked to the specific plant type and building;
- In table 3 only the dominating and life limiting mechanisms should be mentioned, taking into account the country experience and not the theoretically possible;
- In table 3 the good country practice in relation to monitoring and safety strategy is described, while in table 2 they are described in general terms;

Therefore the table 3 will follow the table 1, and will be split into WWER-1000, WWER-440, BWR, and PWR. In each section there will be a series of tables for every building.

(ACTION 7, by 1/7/2005)

Subgroup 3 will review the draft FR taking the following issues into account:

- Incorporate the updated Table 3 (see above) and check the consistency with the Table 2;
- Identify the main attributes of the MS&I program which are LTO relevant;
- Emphasis in Table 3 should be given to the life limiting mechanisms. Other mechanisms may be mentioned but with less detail;
- Include the comments of the previous chapter;
- Develop new text for chapter 3.2 – 3.4 according to the previous "bullets" and integrate it with the existing draft. The section on "Recommendations" should be split into three parts, namely:

a) best practice suggested to the MS,
b) recommendations to the IAEA for future initiatives;
c) recommendations to the scientific community for further development and research needs;

(ACTION 8, by 10/7/2005)

<u>Chapter 4 (References)</u>
The following has been agreed.
All Countries will provide a list of references relevant to LTO and structures.

(ACTION 9, by 10/7/2005)

Subgroup 1 will review the draft FR taking the following issues into account:

- Incorporate the MS contributions to the reference list (see above);
- Include the comments of the previous chapter;
- Develop new text for chapter 4 according to the previous "bullets" and integrate it with the existing draft.

(ACTION 10, by 10/7/2005)

3.3 Method of work and next meeting

WG 4 agreed to keep the subgroup composition already used for Task 2, and repeated below. Each review group identified a leader to facilitate the in-depth discussion and ensure that the review process is conducted in a timely fashion so that the review schedule (see below) would be completed on time.

Review Group	Assigned Final Report Sections
Group 1 – Russian Fed., Bulgaria, Ukraine Group Leader – Mr. Zakharov	Sections 1.0, 2.1, 4.0
Group 2 – USA, Sweden, EC Group Leader – Mr. Gustavsson	Section 2.2, 3.1
Group 3 – Hungary, Czech Rep., Slovakia Group Leader – Mr. Maly	Sections 3.2, 3.3, 3.4

During the discussion of the review process for the CIR reports, WG 4 members agreed to the following review schedule. The review schedule was developed taking into account the WG 4 schedule.

Action Item	Scheduled Date for Completion	Outcome
Review Groups Complete the first iteration on the FR.	10 July 2005	New draft text of the FR chapters from the Review group leaders to the IAEA
The Scientific Secretary (SS) of the IAEA will merge the contributions of the Subgroups and redistribute to all MS	15 July 2005	Draft text of the Final report, n.2
MS comment the new draft	15 September 2005	The SS incorporates the comments and distributes draft n.3
4th WG Meeting, Vienna	19-21 October 2005	

Note:

0. The location of the meeting will be selected later, according to the work development: either places where particularly interesting data/degradation mechanisms are available/visible and worth for sharing among MS, or places where the logistic arrangement is convenient for most of the Members. A proposal from the USA delegate to hold it in the USA (Rockville) was highly appreciated and will be considered.

1. ACTION ITEMS

The following actions items resulted from the meeting:

0. Messrs. Katona and Contri agreed to develop and distribute a draft of the minutes of the meeting by May 21. The draft will be reviewed by the WG 4 Members by May 27, sending the SS a summary of their presentations.
0. The Presentations provided by the MS will be available on the project FTP site (ftp://ftp.iaea.org/pub/Contri/WG4/) since May 21, for two months.
0. Actions according to the revised workplan for WG 4.

REFERENCES

[0] Minutes of the Programme's 1st Steering Committee Meeting, IAEA-EBP-LTO-01, Vienna, 2003 (internal EBP report).

[0] Minutes of the Programme's Planning Meeting, IAEA-EBP-LTO-02, Vienna, 2004 (internal EBP report).

[0] Minutes of the Programme's Planning Meeting, IAEA-EBP-LTO-03, Rev.1 Vienna, 2004 (internal EBP report).

[0] Minutes of the first WG 4 Meeting, IAEA-EBP-LTO-07 Vienna, 2004 (internal EBP report).

[0] Minutes of the second WG 4 Meeting, IAEA-EBP-LTO-14 Vienna, 2005 (internal EBP report).

APPENDIX I : MEETING AGENDA

Tuesday 17 May, 2005		
09:00	Opening, Meeting Objectives	P. Contri
09:15	Chairman summary of the SC conclusions and proposal for the meeting conduct	T.Katona
10:30	Coffee Break	
	National Presentations	
11:00	Bulgaria	M Batishchev, M. Danailov
11:45	Czech Republic	M. Maly
12:30	Lunch Break	
14:00	Hungary	T. Katona
14:45	Russian Federation	E. Zakharov, N. Korobov
15:30	Coffee Break	
16:00	Ukraine	O. Mayboroda, M. Sememnyuk
16:45	Sweden	J. Gustavsson
17:30	Adjourn	
Wednesday 18 May, 2005		
09:00	USA	R. Auluck
09:45	Slovakia	M. Prandorfy
10:30	Coffee Break	
11:00	The EC proposal for the Final Report	C. Rieg
11:45	Discussion of National Approaches: scope of LTO, mechanisms, investigations, assessment methods, repairing actions. Comparison of the available CIRs. Review approach	Chaired by T. Katona
12:30	Lunch Break	
14:00	Data comparison issues: quality, quantity, data support, sources and scope	Chaired by T. Katona
15:00	Method of work, merging data, reporting, deadlines, next meeting	Chaired by T. Katona

17:30	Adjourn	
Thursday 19 May, 2005		
09:00	Updating the WG 4 Workplan. Task 3	Chaired by T. Katona
12:30	Lunch Break	
14:00	Final Discussion, preparation of the minutes (deadline and responsibilities)	Chaired by T. Katona
17:30	Adjourn	

APPENDIX II : LIST OF PARTICIPANTS

BULGARIA

Mr. Mihail Batishchev *Co-chairman*
ATOMTOPLOPROECT
kv. Izgrev, 20 Fr.J.Curie Str. fl.6
1113 Sofia
Bulgaria
Tel.: +359 2 816-45-30
+359 2 816-45-31
+359 2 816-45-33
+359 2 816-45-34
Cell: +359 889 317 492
Fax: +359 2 816-45-32
E-mail: : mail@atomtoploproekt.com

Mr. Stefan Danailov
Kozloduy NPP,
3321 Kozloduy
Bulgaria
Cell:+359 887 493822
Tel.: +359 973 7 3436
Fax: +359 973 7 2445
E-mail: sdanailov@npp.cit.bg

CZECH REPUBLIC

Mr. Jan Maly
NRI-Rez
Energoprojekt
Vyskocilova 3
P.O. BOX 158
140 21 Prague 4
Czech Republic
Tel.: +420 241 006 420
Cell: +420 602 743 188
Fax: +420 241 006 409
E-mail: maly@egp.cz

HUNGARY

Mr. Tamas Katona ***Chairman***
Paks Nuclear Power Plant Co., Ltd.
P.O. Box 71
H-7031 Paks
Hungary
Tel.: +36 75 508576
Cell: +36 20 9422225
Fax: +36 75 508558
E-mail: katonat@npp.hu

LITHUANIA	**Mr. Jevgenij Kozlov** Visaginas 4761 Lithuania Tel: +37038624335 E-mail: kozlove@mail.iae.lt; E-mail: kidd@tts.lt	**(Interpreter)**
RUSSIAN FEDERATION	**Mr. Eduard Zakharov** Atomenergoproect Russian Federation Tel.: +7 095 2638380 Cell: Fax: +7 095 2650974 E-mail: gtb@aep.ru	
	Mr. Nikolai Korobov Ministry of te hRussian Federation for Atomic Energy Concern – "Rosenergoatom" Bolshaya Ordynka 24/26 10917 Moscow Russian Federation Tel.: +7 095 7105680 Fax: +7 095 7105680 E-mail: korobov@rosenergoatom.ru	
SLOVAKIA	**Mr. Milan Prandorfy** VUEZ, a. s., Hviezdoslavova 35, P.o.Box 153 93480 Levice Slovak Republic Tel: + 421 36 638 3160/ 903 454605 Fax: + 421 36 6341617 E-mail: prandorfy@vuez.sk	
	Mr. Daniel Benacka Mochovce NPP 93539 Mochovce Slovak Republic Tel: + 421 36 63 63027 Fax: + 421 36 6391120 E-mail: Benacka.daniel@emo.seas.sk	

SWEDEN	**Mr. Jan Gustavsson** RTTP Ringhals AB SE-430 22 Väröbacka Sweden Tel.: +463 40667950 Cell: + 467 06767950 Fax: + 463 40668389 E-mail: jan.gustavsson@ringhals.se
UKRAINE	**Ms. Olena Mayboroda** SSTC Scientific Center for Nuclear and Radiation Safety Ukraine Tel.: +380 44 452 6203 Fax: +380 44 452 8990 E-mail: ee_mayboroda@sstc.kiev.ua
	Mr. Mikhayl Semenyuk NAEK Energoatom Vetrova,3 Kyiv-01032 Ukraine Tel.: +380 44 201 09 20 Fax: +380 44 294 48 53 E-mail: m.semeniouk@direkcy.atom.gov.ua
USA	**Mr. Rajender Auluck** ***Secretary*** USNRC Division of Regulatory Improvement Programs Mail Stop 0 - 11F1, 11555 Rockville Pike MD 20852 USA Tel.: +1 301 415 1025 Fax: +1 301 415 2002 E-mail: rca@nrc.gov
EUROPEAN COMMISSION	**Mr. Claude Rieg** EC, Directorate General JRC Westerduinweg 3 P.O. Box 2 1755 ZG Petten The Netherlands Tel.: +31 224 565153 Cell: +31 622 312661 Fax: +31 224 565 637 E-mail: claude-ives.rieg@jrc.nl
IAEA	**Mr. Paolo Contri, NSNI-ESS** ***Scientific Secretary***

APPENDIX III : TABLES

Table 1.1 – Scope for WWER440

Name of buildings, structures, structural components and items	Safety Class	Seismic Category	Note (relevance to LTO)
1. Reactor building	2	1	LTO (NR)
1.1 Building basement	2	1	LTO(NR)
1.2 Containment or confinement (hermetic boundary)	2	1	LTO (NR)
1.2.1 Concrete part			heavy concrete shielding
1.2.2 Hermetic liner			
1.3 Containment internal structures	2	1	LTO (NR)
1.4 Crane in reactor hall	2	1	LTO
1.5 Liner of spent fuel pool	2	1	LTO
2. Other buildings and structures	2	1	LTO
2.1 Longitudinal and cross-wise connection buildings	2-3	1	LTO
2.2 Auxiliary building			
2.2.1 Liquid waste storage	2	1	LTO
2.2.2 Solid waste storage	3	11	LTO
2.3 Vent stack	3	11	LTO
2.4 Emergency diesel stations	3	1	LTO (NR)
2.5 Service water systems structures of essential consumers, pumping stations	3	1	LTO (NR) site specific (spray pond, towers or fresh water)
2.6 Piping bridges of safety systems			
2.7 Underground piping and cable ducts of safety systems	3	1	LTO
2.8 Emergency feedwater system structures (piping station, tanks and connections)	3	1	LTO
2.9 Turbine building	3	11	LTO only essential parts
2.10 Shelter, emergency control center	3	11	LTO(NR)
2.11 Fire protection system structures (piping station, underground piping)	2-3	2-3	
3. Structural components			
3.1 Anchorage and supporting structures for safety classified SSC (equipment piping electrical and I&C)	1-3	1-2	LTO
3.2 HELB protection structures	3	2	
3.3 Air locks, hatches	2	1-2	
3.4 Cable and Piping penetration assemblies			
3.5 Fire barriers	3	2	
3.6 Cable trays	3	1-2	

Abbreviations:

IS- important to NPP safety
SR – safety-related
LTO – subject to assessment in terms of long-term operation
LTO (NR) – ditto, but practically not repairable
RPG – responsible for power generation

Table 1.2 – Scope for WWER1000

No	Names of facilities, structures and components	Safety class	Seismic category	Relevance to safety systems
1. REACTOR BUILDING				
1.1.	Foundation soil of the building – natural or artificial			
1.2.	Foundation part of the building			
1.3.	Containment			
1.4.	Internal structures of containment			
1.5.	Polar crane's cantilevers			
1.6.	Spent fuel storage pool			
1.6.1	Hermetic steel liner of the spent fuel storage pool			
1.7.	Emergency boric solution tank			
1.8.	Rooms adjacent to containment			
1.9.	Steel ventilation stack			
2. OTHERS BUILDINGS AND FACILITIES				
2.1.	Turbine's soil foundation			
2.2.	Turbine's foundation structure			
2.3.	Turbine hall			
2.4.	Cooling pump station and service water pump station			
2.5.	Diesel generator building			
2.6.	Spray cooling pools or cooling towers for responsible consumers			
2.7.	Pump stations and channels for responsible consumers			
2.8.	Underground pipe and cable ducts of safety systems			
2.9.	Auxiliary building with vent. stack			
2.9.1	Liquid RAW storage			
2.9.2	Solid RAW storage			
2.10	Spent nuclear fuel storage building			
2.11	Fresh nuclear fuel storage building			
2.12	Protected control building			
2.13	Building and civil structures of the fire protection system			

Table 1.3 – Scope for PWR and BWR

Structures	Structural components
Containments	PWR (reinforced or pre-stressed concrete / steel – common components)
	BWR (Mark I {steel} – Mark II {reinforced or pre-stressed concrete / steel} – Mark II {reinforced or pre-stressed concrete / steel} – common components)
Seismic Category 1 Structures	BWR reactor building, PWR shield building, control room/building
	BWR reactor building with steel superstructure
	auxiliary building, diesel generator building, rad-waste building, turbine building, switchgear room, yard structures (auxiliary feed-water pump house, utility/piping tunnels, security lighting poles, manholes, duct banks), Station Black Out structures (transmission towers, start-up transformer circuit breaker foundation, electrical enclosure)
	containment internal structures, excluding refuelling canal
	fuel storage facility, refuelling canal
	water-control structures (e.g., intake structure, cooling tower, and spray pond)
	concrete tanks and missile barriers
	(non pressurised) steel tanks and missile barriers
	BWR unit vent stack
Seismic Category 1 component supports	supports for Class 1[1] piping and components (embedded parts)
	supports for Class 2[1] and 3[1] piping and components (embedded parts)
	supports for Class MC[1] components (embedded parts)
	supports for cable tray, conduit, HVAC ducts, tube track, instrument tubing, non-ASME piping and components
	anchorage of racks, panels, cabinets, and enclosures for electrical equipment and instrumentation
	supports for miscellaneous equipment (e.g., EDG, HVAC components); and Group B5: supports for miscellaneous structures (e.g., platforms, pipe whip restraints, jet impingement shields, masonry walls)

Non-Seismic Category I Structures Within the Scope of License Renewal	Intake Structures & Canal
	Equipment Supports and Foundations
	Structural Bellows
	Controlled Leakage Hatches & Doors
	Penetration Seals
	Compressible Joints and Seals Fuel Pool and Sump
	Liners
	Concrete Curbs
	Off-gas Stack and Flue
	Fire Barriers
	Pipe Whip Restraints and Jet Impingement Shields
	Electrical and Instrumentation and Control Penetration Assemblies
	Instrumentation Racks, Frames, Panels and Enclosures
	Electrical Panels, Racks, Cabinets and Other Enclosures
	Cable Trays and Supports
	Electrical Conduits
	Tube Track

[1]: Refers to the relevant design code (ASME, RCC, KTA, OPB, etc) / classification levels and denominations may be adapted accordingly

Table 2 – Degradation mechanisms - Template

Environment	Material	Degradation Mechanisms		Structure Structural Component Inspection / Monitoring				Safety Strategy (AM)	
		Mechanisms	Effect	Location	Method	Frequency	Criterion	Trending	Mitigation
➢ Air (inside)	Concrete	✓ Cracking	✓ Steel bar corrosion	✓ Vicinity of supports / in beams ✓ High stressed zones	✓ Humidity / condensation ? ✓ Width ?	✓ ✓	✓ Design code parameters ✓	✓ Root cause analysis	✓ ?
		✓ Carbonation	✓ Steel bar corrosion	✓ NO					
		✓ Dehydration (high temperature exposure)	✓ Strength reduction	✓ RPV shaft ✓ Penetrations	✓ ✓	✓ ✓	✓ ✓		
	Steel bars	✓ ???????	✓	✓					
➢ Air (outside / seaside)	Concrete								
	Steel bars								
➢ Air (outside / riverside)	Concrete								
	Steel bars								
➢ Salt water	Concrete								
	Steel bars								
➢ Sweet water	Concrete								
	Steel bars								
➢ Soft soil	Concrete								
	Steel bars								
➢ Hard soils	Concrete								
	Steel bars								

Table 3 – Operational issues – Template – Plant specific

Building					
Structure / building	Component/ part	Materials	Stressors (Environment, loading, etc)	Location/Zone	Good practice