**IAEA-EBP-LTO-24**
**Draft 171205**

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

## MINUTES OF THE WG L/S MEETING

PNNL, Seattle, WA, USA, 26 – 30 September 2005

**INTERNATIONAL ATOMIC ENERGY AGENCY**

## 1. 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], 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 .

In mid 2005 the Programme activities entered the final phases. To co-ordinate the effort, A WG leaders and secretaries meeting was organized by the Agency and hosted by PNNL at its Seattle office, 26-29 September 2005. The objectives of the meting were:

- to review and consolidate the outcomes of the activities conducted within the Programme to date,
- to co-ordinate the preparation of the Final Working Group Reports,
- to initiate the development of the Final Programme Report, and,
- to establish a basis for a Safety Guide on long term operation.

The Agenda for the Meeting is provided in Appendix I. The list of participants is provided in Appendix II. Appendix III provides the revised tables of contents of the Final Working Group Reports and Appendix IV the outline of the Final Programme Report.

## 2. MEETING SUMMARY

Mr. Radim Havel, the Programme Scientific Secretary, opened the meeting, and outlined the expected outcomes from the meeting which were:

- Provide a status of each Final Working Group Report (FWGR)
- Provide an initial set of recommendations from each working group that would be included in the Final Working Group Report
- Review the existing table of content for the Final Working Group Reports, revise based upon the information gathered from the country information reports and outline the content that would be in each section based upon any revisions
- Review the Final Programme Report (FPR) table of contents, revise as appropriate and outline the contents in each section. The IAEA plans to use the report as a basis for a Safety Guide on LTO.
- Develop schedule for completion of the Final Working Group Reports and of the Final Programme Report.

### 2.1. FINAL REPORTS

Each working group leader presented a status the Working Group Final Report. Basically all Working Groups have completed an initial draft of the working group report and sent the initial draft out for review and comment to Working Group members. The specific presentations and recommendations are provided in Appendix V to this report.

During the discussion of the status of working group reports the following points were agreed upon.

- General or generic recommendations should be moved to WG 1 report.
- Final Working Group Reports Table of Contents were revised and are simpler and consistent for each working group. The revised Tables of Contents for each Working Group are provided in Appendix III. Conversion of the current working group reports into the revised table of contents should not result in significant additional work; the conversion should be mainly formatting.
- The Final Programme Report Table of Contents was reviewed in light of the revised Table of Contents for each WG and the revised version is provided in Appendix IV. The meeting participants agreed to a schedule for completing the final program report.
- The Final Programme Report should be written in a style that would make its conversion to a safety guide as easy as possible.
- The schedule for completing the FWGR and FPR was agreed upon:

| ***Activity*** | ***Proposed Date*** |
|---|---:|
| FWGR final draft | 5 December 2005 |
| 4th Steering Committee Meeting | 23-25January 2006 |
| WG L/S co-ordination | 26 January 2006 |
| finalize FWGR | 15 March 2006 |
| PFR 1st draft | 24 March 2006 |
| PFR Integration & Review Process | April and May 2006 |
| PFR Integration Meeting | 23 -25 May 2006 |
| PFR 2nd draft | 18 August 2006 |
| Final Meeting (Combined with SC) | September 2006 |

2.2. UPCOMING SALTO MEETINGS

The following should be the focus of the upcoming WGs meetings:
future challenges/open issues
recommendations
completion of FWGR
follow-up activities

The Provisional Agendas for the upcoming Programme meetings are:

WG1
Location: UJV Rez, Prague, Czech Republic

| **14 Nov** | | |
|---|---|---|
| 09:00 | Opening | X.Y, R. Havel |
| 09:30 | Presentation and review of the draft Final WG 1 Report cont'd, Section 1 | P-T. Kuo, Z. Kriz |
| *10:30* | *Coffee Break* | |
| 11:00 | Presentation and review of the draft Final WG 1 Report cont'd, Section 2.1 | P-T. Kuo, Z. Kriz |
| *12:00* | *Lunch* | |
| 13:30 | Presentation and review of the draft Final WG 1 Report cont'd, Section 2.2 and 2.3 | P-T. Kuo, Z. Kriz |
| *15:30* | *Coffee break* | |
| 16:00 | Presentation and review of the draft Final WG 1 Report cont'd, Section 2.4 | P-T. Kuo, Z. Kriz |
| *17:00* | *Adjourn* | |
| **15 Nov** | | |
| 08:30 | Presentation and review of the draft Final WG 1 Report cont'd, Section 2.5 and 2.6 | P-T. Kuo, Z. Kriz |
| *10:30* | *Coffee Break* | |
| 11:00 | Presentation and review of the draft Final WG 1 Report cont'd, Section 2.7 | P-T. Kuo, Z. Kriz |
| *12:00* | *Lunch* | |
| 13:30 | Presentation and review of the draft Final WG 1 Report cont'd , Section 3 and 4 | P-T. Kuo, Z. Kriz |
| *15:30* | *Coffee break* | |
| 16:00 | Presentation and review of the draft Final WG 1 Report cont'd, Section 5 and 6 | P-T. Kuo, Z. Kriz |
| *18:00* | *Adjourn* | |
| **16 Nov** | | |
| 09:00 | Final WG 1 Report content and finalization schedule | P-T. Kuo |
| *10:00* | *Coffee Break* | |
| 10:30 | Final Programme Report and follow-up activities | P-T. Kuo |
| 13:00 | Closing remarks | P-T. Kuo, R.Havel |
| *13:30* | *Adjourn* | |

WG 2 - Final Meeting of Working Group 2 - Materials and Mechanical Components
Location: Vienna, Austria
October 31 to November 2, 2005
Objective:
The objective of this meeting is to: 1) review the second draft of the Working Group 2, 2) develop a resolution for any conflicting opinions and 3) agree to a schedule to complete the

final draft by November 30 in order to submit the final draft to the IAEA secretary by December 5, 2005.

Monday October 31
Morning 9:00 to 12:30

| | |
|---|---|
| Opening Welcome | R. Havel |
| Review and Agree to Agenda | T. Taylor |
| Review and Comment on New TOC | T. Taylor |
| Review and Comment on Section 2.0 | Sandor Ratkai |
| - Agree on Action Items | |
| Review and Comment on Section 3.0 | Sandor Ratkai |
| - Agree on Action Items | |

Afternoon 14:00 to 17:00

| | |
|---|---|
| Review and Comment in Section 4.1 – 4.3 | Robert Krivanek |
| - Agree on Action Items | |

Tuesday November 1
Morning 9:00 to 12:30

| | |
|---|---|
| Review and Comment on Section 4.4 to 4.7 | Sergey Malkov |
| - Agree on Action Items | |

Afternoon 14:00 to 17:30

| | |
|---|---|
| Review and Comment on Section 4. 8 to 4.10 | Fred Barnekow |
| - Agree on Action Items | |

Wednesday November 2
Morning 9:00 to 12:30

| | |
|---|---|
| Review and Comment on Section 5.0 TLAAs | T. Taylor |
| - Agree on Action Items | |

Afternoon 14:00 to 17:00

| | |
|---|---|
| Agree on Action Items and Close | T. Taylor |

WG 3

**WG 3 – Fourth Working Group Meeting**
**IAEA, November 15-17, 2005**
**PROVISIONAL AGENDA**

| **Tuesday 15 November, 2005** | | |
|---|---|---|
| 09:30 | Opening,<br>Meeting Objectives | A. Godoy, Act.Head ESS<br>E. Liszka |
| 09:40 | Chairman summary on WG leaders' + Secretaries' co-ordination Mtg. in Seattle:<br>• Schedule of work 2005 – 2006<br>• New table of content for WG Final Reports<br>• New table of content for Programme Final Report | A. Duchac |
| 10:00 | Discussion on the text of WG3 Final Draft Report: | A. Duchac, D. Jarell |

| | | |
|---|---|---|
| | • Review of the text based on changes introduced by Seattle Meeting; | WG Members |
| 10:30 | Coffee Break | |
| 11:00 | Discussion on the text of WG3 Final Draft Report:<br>• Review of the text based on changes introduced by Seattle Meeting, cont'd; | A. Duchac, D. Jarell<br>WG Members |
| 12:30 | Lunch Break | |
| 14:00 | Discussion on the text of WG3 Final Draft Report:<br>• Review of the text based on changes introduced by Seattle Meeting, cont'd; | A. Duchac, D. Jarell<br>WG Members |
| 15:30 | Coffee Break | |
| 16:00 | Discussion on the text of WG3 Final Draft Report:<br>• Review of the content, consistency, tables | A. Duchac, D. Jarell<br>WG Members |
| 17:45 | Adjourn | |
| 18:00 | Social event | IAEA |
| **Wednesday 16 November, 2005** | | |
| 09:00 | Discussion on the text of WG3 Final Draft Report:<br>• Review of the content, consistency, tables, cont'd | A. Duchac, D. Jarell<br>WG Members |
| 10:30 | Coffee Break | |
| 11:00 | Discussion on the text of WG3 Final Draft Report:<br>• Example of Scoping exercise for E, I&C active and passive components | A. Duchac, D. Jarell<br>WG Members |
| 12:30 | Lunch Break | |
| 14:00 | Discussion on the text of WG3 Final Draft Report:<br>• Review of recommendations | A. Duchac, D. Jarell<br>WG Members |
| 15:30 | Coffee Break | |
| 16:00 | Discussion on the text of WG3 Final Draft Report:<br>• Review of recommendations, cont'd | A. Duchac, D. Jarell<br>WG Members |
| 17:30 | Resolve issues of the Final WG Report, accept the content and the recommendations | A. Duchac, D. Jarell |
| 18:00 | Adjourn | |
| **Thursday 17 November, 2005** | | |

| | | |
|---|---|---|
| 09:00 | Identification of remaining tasks and implementation schedule;<br>Adjustment of the Final Report, Preparation of the minutes | A. Duchac, D. Jarell |
| 12:30 | Lunch Break | |
| 14:00 | Final Discussion, preparation of the minutes (deadlines and responsibilities) | A. Duchac, D. Jarell |
| 15:00 | Closure of the meeting | E. Liszka |

WG 4, 19-21 of October 2005, IAEA,Vienna

1. Information on WG L/S Meeting in Seattle (30 min)
    - time schedule of work 2005-2006
    - new table of content for WG Reports
    - TOC of SALTO FR, WG4 contribution to SALTO FR

    Discussion on the text of WG4 Draft Report (2 and half days. Please, note, that 12-15 pages of the WG4 draft report shall be reviewed per day.)
    - Review of the text based on changes introduced by Seattle Meeting
    - Review of the tables, content, consistency
    - Review of recommendations
    - Suggestions for a CRP

    Accept the content and the recommendations of WG4 report (1 hour)
    Identification of remaining tasks and their schedule (1 hour)

The draft of the WG4 Report will be sent 12 of October 2005. Please, note, that the summary of country practices should not be made on the country-by-country basis.

Formal country presentations should not be prepared. Country contribution needed only to the draft of WG4 Report.

Please, prepare the drafts of the suggested changes to the text, because we would like to finalize the content of the WG4 report. If it is possible, the suggested changes could be sent to the WG4 members in advance per e-mail.

4th Steering Committee and WG leaders/secretaries co-ordination meeting
IAEA, Vienna

| **23 January** | | |
|---|---|---|
| 14:00 | Opening | |
| 14:30 | MS statements | |
| *18:00* | *Adjourn* | |
| **24 January** | | |
| 9:00 | Final WG Reports presentation | |
| *12:30* | *Lunch* | |
| 14:00 | Discussion | |
| *18:00* | *Adjourn* | |

| | | |
|---|---|---|
| **25 January** | | |
| 9:00 | Final Programme Report presentation | |
| *12:30* | *Lunch* | |
| 14:00 | Discussion | |
| | Open issues | |
| | Action items | |
| *16:30* | *Adjourn* | |
| **26 January** | | |
| 09:00 | WG leaders co-ordination meeting | |
| *17:00* | *Adjourn* | |
| **27 January** | | |
| 09:00 | WG leaders co-ordination meeting | |
| *13:00* | *Adjourn* | |

2.3. FUTURE ACTIVITIES

In connection with the discussion of the outcomes of the Programme upon its completion in the end of 2006, the needed follow-up activities were also discussed. The Agency is considering the following possible mechanisms:

- *LTO or engineering safety service;* The safety service will be a broad scope engineering safety service integrating the current narrow scope engineering safety services, will complement the OSART and utilize its general elements. The purpose of the service will be to review the activities undertaken by the licensees under the LTO programme (adequacy, address the appropriate LTO issues, etc.), such as the review of scoping and screening process of systems, structures, and components for inclusion for evaluation for LTO, ageing management review process and, a review of the proposed or existing ageing management programmes to manage the expected ageing effects.

- *exchange of experience through Workshops and technical meetings*

- *co-ordinated research programme*

The open issues and future challenges identified during this Programme should be addressed through these activities. Examples are:

- Training Workshops on Specific Topics
  - o Scoping and Screening
  - o Review methodology of existing programmes
  - o Develop Technical Justification for TLAAs
  - o Workshop on Evaluation of LTO Applications that reference Risk Informed ISI

    Objective: The objective of this workshop is to provide regulators with training in the technical evaluation of LTO ISI programs that implement Risk Informed ISI.
    Description of Need: Risk Informed ISI is relatively new concept and its implementation is not well understood by the regulators in MS. MS have expressed the need for a workshop that would help provide the technical background to provide a more adequate review of LTO applications that reference Risk Informed ISI programs
    Outcome: The workshop will provide participants with the technical background to review LTO Risk Informed ISI applications. The workshop will provide participants with a set of technical reference documents, explain the basic

concepts involved in Risk Informed ISIS and conduct several practical review exercises.

- Workshop on application of NDE methods and frequency of inspection in LTO applications

  Objective: The objective of the workshop is to provide MS regulators with training on evaluating the adequacy and suitability of NDE methods to detect and characterize degradation important to LTO and technical background to evaluate the adequacy of inspection frequency.

  Description of Need: Implementation of NDE methods and inspection frequency is a corner stone of LTO applications. Recent research has shown that NDE inspection methods and inspection frequency are often not adequate for LTO applications.

  Outcomes: This workshop will provide regulators and plant operators with technical references and practical information that will enable regulators and plant operators to evaluate the effectiveness of proposed NDE inspection methods and inspection frequencies in adequately detecting and characterizing degradation important in LTO is not obvious.

- For the evaluation of aged status of RC structures (evaluations of ISI and monitoring data) adequate methods and criteria needed. Research results and in some countries experience exists how to develop criteria for assessment of acceptable parameters related to ageing effects and what forecast methodologies are applicable. A CRP may generalize the particular experience and provide criteria and methodologies applicable for the MS.

- In case of some important structures and structural components within the scope of LTO sensitive locations could not be accessed for the monitoring (e.g. parts of liner, reactor support structures in case of WWER-440). Adequate methods are needed for assessment the ageing in these locations. Coordinated research effort needed for the development of methods of assessment of ageing effects on non-accessible locations based on the monitoring data of accessible places and material and environmental properties at critical places.
- comparison of old and new codes and standards (CRP)
- optimal practices of EQ for cables
- optimal practices for CM

Each of the broad topical areas above needs to be developed further by including details for:

- Objective
- Description of need
- Desired outcomes that benefit MS

One of the outcomes of the SALTO program report will be a

- *LTO database*

This database will contain information on environment/material/degradation mechanisms/ inspection/ mitigation measures for a give structure or a structural component. This database will contain very useful information for use by MS. Based on the operating experience and new research and information. This database could be updated each year or every two years. To be fully useful, this database needs to be available online with proper controls.

## 2.4. ACTION ITEMS

1. WG L/S should request missing input to FWGR from respective WG members before next WG meetings.
2. FWGR should be made available among WG L/S; R.Havel
3. WG L/S review FWGR to identify gaps and overlaps and also with respect to LTO-03 (the PSR table)
4. WG L/S should give priority to review of identified future challenges and proposed recommendations during the upcoming WG meetings
5. FPR should include the Fig. 2 from LTO-03 (relation between LTO-CM-DB-PSR), action WG L/S
6. preconditions where variable quality exists should be considered as future challenges or open issues; action WG L/S

## APPENDIX I.
## PROVISIONAL AGENDA

| **26 September** | | |
|---|---|---|
| 09:00 | Opening, Meeting Objectives | R. Havel |
| 09:15 | WG 1 final report (development-history, overview, open issues, finalization plan, deviations from the original TOCs, consistency with other WGs final reports) | Z. Kriz |
| 10:00 | WG 2 final report | T.Taylor |
| *10:45* | *Coffee Break* | |
| 11:15 | WG 3 final report | A. Duchac |
| 12:00 | WG 4 final report | T. Katona |
| 12:45 | Discussion | all |
| *13:00* | *Lunch* | |
| 14:00 | WG 1 final report recommendations | P-T. Kuo |
| 14:30 | WG 2 final report recommendations | T.Taylor |
| 15:00 | WG 3 final report recommendations | A.Duchac |
| *15:30* | *Coffee break* | |
| 16:00 | WG 4 final report recommendations | T.Katona |
| 16:30 | Discussion | all |
| *17:00* | *Adjourn* | |
| **27 September** | | |
| 09:00 | Review Final Programme Report outline<br>inputs from final WG reports<br>scoping and screening process recommendations<br>who drafts and reviews<br>how and what input is needed when-schedule<br>complete the outline based on WG final reports<br>agree schedule for completion | R.Havel |
| 11:00 | Review and discussion cont'd | all |
| *12:30* | *Lunch Break* | |
| 14:00 | Review and discussion cont'd | all |
| 17:00 | Adjourn | |
| **28 September** | | |
| 09:00 | Review and discussion cont'd | all |
| *12:30* | *Lunch Break* | |
| 14:00 | Review and discussion cont'd | all |
| 17:00 | Adjourn | |
| **29 September** | | |
| 09:00 | Resolutions, Action items, Open issues | all |
| *12:30* | *Lunch Break* | |
| 14:00 | Draft meeting minutes | all |
| 17:00 | Adjourn | |
| **30 September** | | |
| 9:00 | Draft meeting minutes (contingency) | |

## APPENDIX II
## LIST OF PARTICIPANTS

**Mr. Pao-Tsin Kuo**
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulation,
Mail Stop 0 11F1,
Washington, D.C. 20555
United States of America
Tel.: + 1 301 415 1183
Fax: + 1 301 415 2002
E-mail: PTK@nrc.gov

**Mr. Zdenek Kriz**
SUJB, UJV a.s.
25068 Rez
Czech Republic
Tel.: +420 266 17 3424
Cell: +420 602 62 1040
Fax: +420 266 1734 68
E-mail: krz@ujv.cz

**Mr Tom T. Taylor**
Pacific Northwest National Laboratory (PNNL)
2400 Stevens, Mail Stop K5-26,
Richland, WA 99352,
USA
Tel.: +1 509 375 4331
Fax: +1 509 375 6736
E-mail: tt.taylor@pnl.gov

**Mr. Alexander Duchac**
EC, Directorate General JRC
Westerduinweg 3
P.O. Box 2
1755 ZG Petten
The Netherlands
Tel.: +3122 4565
Fax: +3122 4565
E-mail: alexander.duchac@jrc.nl

**Mr. Donald Jarrell**
Pacific Northwest National Laboratory (PNNL)
902 Battelle Boulevard
P.O. Box 999
Richland, WA 99352
USA
Tel.: +1 509 372-4096
E-mail: Don.Jarrell@pnl.gov

**Mr. Tamas Katona**
Paks Nuclear Power Plant Co., Ltd.

P.O. Box 71
H-7031 Paks
Hungary
Tel.: +36 75 508576
Fax: +36 75 508558
E-mail: katonat@npp.hu

**Mr. Rajender Auluck**
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

**Mr. Radim Havel**
IAEA

## APPENDIX III
## REVISED FINAL WORKING GROUP REPORTS TABLES OF CONTENTS

### WG 1

- 3.1 Background
- 3.2 Common elements and differences
- 3.3 Future Challenges
- 3.4 Recommendations

4.0 Recommended activities for LTO
- 4.1 Background
- 4.2 Common elements and differences
- 4.3 Future Challenges
- 4.4 Recommendations

5.0 Evaluation of existing programs for LTO
- 5.1 Background
- 5.2 Common elements and differences
- 5.3 Future Challenges
- 5.4 Recommendations

6.0 Available research results and operating experiences
- 6.1 Background
- 6.2 Common elements and differences
- 6.3 Future Challenges
- 6.4 Recommendations

7.0 List of references

**WG 2**

1. Requirements

2. Scoping of systems, structures and components
   - 2.1. Background
   - 2.2. Common elements and differences
   - 2.3. Future challenges
   - 2.4. Recommendations

3. Aging Management Programs
   - 3.1. Background
     - 3.1.1. Applicable Aging Effects
     - 3.1.2. Ageing mitigation measures
   - 3.2. Common elements and Differences
   - 3.3. Identification of Future Challenges
   - 3.4. Recommendations

4. Operational Programs
   - 4.1. In-service Inspection Practices for passive Components
     - 4.1.1. Background
     - 4.1.2. Common elements and Differences
     - 4.1.3. Identification of Future Challenges
     - 4.1.4. Recommendations

   - 4.2. Maintenance Codes or Practices for Active Components
     - 4.2.1. Background
     - 4.2.2. Common elements and Differences
     - 4.2.3. Identification of Future Challenges

4.2.4. Recommendations

4.3. Equipment Qualification Practices
4.3.1. Background
4.3.2. Common elements and Differences
4.3.3. Identification of Future Challenges
4.3.4. Recommendations

4.4. Component function tests
4.4.1. Background
4.4.2. Common elements and Differences
4.4.3. Identification of Future Challenges
4.4.4. Recommendations

4.5. Applied diagnostic systems
4.5.1. Background
4.5.2. Common elements and Differences
4.5.3. Identification of Future Challenges
4.5.4. Recommendations

4.6. Surveillance specimen programmes
4.6.1. Background
4.6.2. Common elements and Differences
4.6.3. Identification of Future Challenges
4.6.4. Recommendations

4.7. Nondestructive material properties Testing
4.7.1. Background
4.7.2. Common elements and Differences
4.7.3. Identification of Future Challenges
4.7.4. Recommendations

4.8. Destructive Material testing
4.8.1. Background
4.8.2. Common elements and Differences
4.8.3. Identification of Future Challenges
4.8.4. Recommendations

4.9. Load monitoring systems
4.9.1. Background
4.9.2. Common elements and Differences
4.9.3. Identification of Future Challenges
4.9.4. Recommendations

4.10. Chemical regimes monitoring
4.10.1. Background
4.10.2. Common elements and Differences
4.10.3. Identification of Future Challenges
4.10.4. Recommendations

5. Time Limited Aging Analysis
5.1.1. Background

5.1.2. Common elements and Differences
5.1.3. Identification of Future Challenges
5.1.4. Recommendations

6. References

APPENDICES

**WG 3**

1. Requirements

2. Scoping of systems, structures and components
   2.1 Background
   2.2 Common elements and differences
   2.3 Future challenges
   2.4 Recommendations

3. Aging management programs
   3.1 Background
   *3.1.1 Applicable Aging Effects*
   *3.1.2 Ageing mitigation measures*
   3.2 Common Elements and Differences
   3.3 Future challenges
   3.4 Recommendations

4 Operational programs
   4.1 Maintenance standards or practices for active components
   *4.1.1 Background*
   *4.1.2 Common elements and differences*
   *4.1.3 Future challenges*
   *4.1.4 Recommendations*

   4.2 Environmental qualification practices
   *4.2.1 Background*
   *4.2.2 Common Elements and Differences*
   *4.2.3 Future challenges*
   *4.2.4 Recommendations*

   4.3 Component functional tests
   *4.3.1 Background*
   *4.3.2 Common Elements and Differences*
   *4.3.3 Future challenges*
   *4.3.4 Recommendations*

   4.4 Diagnostic and prognostic systems
   *4.4.1 Background*
   *4.4.2 Common Elements and Differences*
   *4.4.3 Future challenges*
   *4.4.4 Recommendations*

   4.5 Surveillance specimen programmes

*4.5.1 Background*
*4.5.2 Common elements and differences*
*4.5.3 Future challenges*
*4.5.4 Recommendations*

4.6 Nondestructive material properties testing
*4.6.1 Background*
*4.6.2 Common elements and differences*
*4.6.3 Future challenges*
*4.6.4 Recommendations*

4.7 Destructive material properties testing
*4.7.1 Background*
*4.7.2 Common elements and differences*
*4.7.3 Future challenges*
*4.7.4 Recommendations*

4.8 Load monitoring system
*4.8.1 Background*
*4.8.2 Common elements and differences*
*4.8.3 Future challenges*
*4.8.4 Recommendations*

4.9 Chemical regimes monitoring
*4.9.1 Background*
*4.9.2 Common elements and differences*
*4.9.3 Future challenges*
*4.9.4 Recommendations*

5 Time Limited Ageing Analysis
5.1 Background
5.2 Common elements and differences
5.3 Future challenges
5.4 Recommendations

6 References

**WG 4**

1.0 Requirements
2.0 Scoping of systems, structures and components
2.1 Background
2.2 Common elements and differences
2.3 Future challenges
2.4 Recommendations
3.0 Ageing management programmes
3.1 Background
3.1.1 Applicable ageing effects
3.1.2 Ageing Mitigation Measures
3.2 Common elements and differences
3.3 Future challenges
3.4 Recommendations

## APPENDIX IV
## FINAL PROGRAMME REPORT OUTLINE

**Executive Summary**

**1. Introduction**

- Background/history
- Objective
- Scope
- Structure

**2. General Regulatory Framework for Long Term Operation**

2.1 Definition of LTO
- Definition
- Basis of approval for LTO

2.2 Laws and regulations relevant to LTO
- Recommendations for laws and regulations relevant to LTO

2.3 Description of LTO Process
- Development of a process to implement the laws and regulations for LTO
- Roles and responsibilities
- Treatment of emerging issues
- Provide recommendations for processes to resolve emerging issues

2.4 General design codes
- Documentation of design codes used
- Comparison with international recognized codes and standards
- Criteria for updating

2.5 Preconditions
- FSAR or similar licensing document
- Maintenance practice
- EQ
- QA
- ISI
- Configuration management
- TLAA

2.6 Scoping and screening process
- Flowchart
- Tables for scoping
- Tables for screening
- Description

2.7 Attributes of ageing management programme
- 9 attributes with a description
- reference to the AM Safety guide (consistency!)

**3. Ageing management programmes**

Mechanical components and materials
- Provide recommendations for goals for acceptable AMPs specific to WG 2
- Provide list of AMPs that are recognized as acceptable for managing degradation in SSCs
- Provide list of open technical issues and recommend technical exchange meetings to help resolve open issues

Electrical and I&C components

- Provide recommendations for goals for acceptable AMPs specific to WG 3
- Provide list of AMPs that are recognized as acceptable for managing degradation especially on electrical cables and connections
- Provide list of open technical issues and recommend technical exchange meetings to share information on degradation mechanisms and mitigation techniques for electrical cables and connections to help resolve open issues

Structural components and structures

- Provide recommendations and references for development of acceptable AMP; identification of relevant degradation mechanisms, monitoring and inspection methods, frequency and criteria of monitoring, also mitigation methods
- Identify technical issues and recommend measures, research activities for resolution of issues

**4. Operational programmes**

4.1 In-service inspection practices for passive components

Mechanical components and materials

- Provide recommendations for acceptable ISI programs specific to WG 2; as an example, determine if NDE methods are appropriate for identified degradation, determine if frequency of ISI inspections is appropriate for degradation mechanism, develop process to verify that ISI is effective (PDQ), etc.
- Provide specific recommendations for Risk Informed ISI; as example recommend verification process if one uses EPRI method or Westinghouse method, etc.

Structural components and structures

- Provide recommendations and references for review and development of acceptable for LTO ISI programs;
- Identify technical issues and recommend measures, research activities for resolution of issues

4.2 Maintenance codes or practices for active components

Mechanical components and materials

- Provide recommendations for acceptable maintenance programs; for example, recommend technical justification for frequency of testing program, recommend attributes for acceptance criteria for specific components
- Provide specific recommendations for Risk Informed maintenance programs

Electrical and I&C components

- Provide recommendations for acceptable maintenance programs; for example, recommend technical justification and minimum criteria for replacement EQ and non EQ EI&C equipment,

Structural components and structures

- Provide recommendations and references for review and development of acceptable for LTO maintenance programs;
- Identify technical issues and recommend measures for resolution of issues

4.3 Equipment Qualification

Mechanical components and materials

- Provide recommendations for acceptable EQ programs; recommend specific evaluation techniques for specific components (
- Provide specific recommendations for Risk Informed ISI

Electrical and I&C components

- Provide recommendations for acceptable EQ programs; recommend specific evaluation techniques for specific EI&C components, evaluating non EQ EI&C equipment that are used on safety related systems, reassessment of component qualified life prior to reaching the aging limits established in the evaluation, etc.

4.4 Component functional tests

Mechanical components and materials

- This topic may be merged with section 4.2 Maintenance

Electrical and I&C components

- Provide recommendations of minimum criteria for determining EI&C equipment that will be subject to functional testing.

4.5 Diagnostics and monitoring

Mechanical components and materials

Electrical and I&C components

- Provide recommendation on applying diagnostic and prognostic systems to detect actual component conditions with possibility to predict possible component degradation under given operational conditions.

4.6 Surveillance specimen programmes

Mechanical components and materials

- Provide recommendations for acceptable surveillance programs; for example, recommend technical justification for frequency of testing program, recommend attributes for acceptance criteria for specific components

Electrical and I&C components

- Provide recommendation for acceptable surveillance programme, for example controlled ageing programmes namely for electrical cables should be implemented in member states NPPs.
- Experiments should be carried out verifying the influence of the current effect of gamma radiation, increased temperature and electric load of the cables with the aim to create a relevant mathematical model

4.7 Nondestructive material properties testing

Mechanical components and materials

- The only property measurement routinely measured is hardness testing; provide recommendations for specific hardness techniques; List open issues and recommendation exchange of technical information to help resolve open issues

Electrical and I&C components

- Provide recommendation on using non destructive testing methods to monitor degradations of materials on EI&C equipment during LTO

4.8 Destructive Material testing

Mechanical components and materials

- Provide recommendations for acceptable destructive material testing programs; for example, recommend technical justification for frequency of testing program, recommend attributes for acceptance criteria for specific components

Electrical and I&C components

- Provide recommendation on applying destructive testing methods to monitor degradations of materials (i.e. cables) during LTO

4.9 Chemical regimes monitoring

Mechanical components and materials

- Provide recommendations for goals for acceptable water chemistry; as an example recommend technical justification for water chemistry monitoring criteria; recommend technical justification for frequency of water chemistry analysis
- Provide list of water chemistry programs that are recognized as acceptable for managing degradation in SSCs

## 5. Time Limited Aging Analysis

Mechanical components and materials

- Provide recommendations for goals for acceptable TLAAs
- Provide list of TLAAs that are recognized as requiring evaluation for LTO

Electrical and I&C components

- Provide recommendations for goals for acceptable TLAAs
- Provide list of TLAAs that are recognized as requiring evaluation for LTO in order to demonstrate qualified life of EI&C equipment for LTO

Structural components and structures

- Identify technical issues, methodological problems and research needs for time limited ageing analyses and ageing evaluation of structures
- Provide recommendations for TLAA and ageing evaluation of structures of structures

## 6. References

**APPENDIX V**
**PRESENTATIONS**

**WG1a**

# WG – 1 history overview and draft report

Zdenek Kříž
secretary of WG - 1

SALTO meeting
Seattle, 26 –30 September 2005

1

## Participation in EBP

USA (initiator)
WWER countries (Bulgaria, Czech rep., Finland, Hungary, Russia, Slovakia, Ukraine)
Sweden, Netherlands (since 2005)
European Union (JRC Petten)

## Country representation

regulatory body (USA, Hungary, Sweden)
regulatory body + operator (Czech rep., Russia, Ukraine)
TSO (Finland, Slovakia)
operator (Bulgaria)

changes (CR, Slovakia, Ukraine)

2

**Meetings :** 1st 1/2004, Vienna, presentations, methodogy
2nd 8/2004, Stockholm, CIR, 4 subgroups
3rd 5/2005, Washington D.C, Revreps of subgroups
4th 11/2005, Rez, draft of WG – 1 report (planned)

**Subgroups:** 1 – Russia, Ukraine
2 – Czech rep., Slovakia
3 – Bulgaria, Hungary
4 – Finland, Sweden

Revreps of different quality, particularly challenges were not completed.
Chapter 7 – References – important (nat and intenat. – IAEA, NEA, IEEE, IEC)

3

DRAFT OF WG – 1 REPORT

**1.0 Laws and regulation**

two contributions (revrep, scisec) – to be combined
important topics: definitions
two approaches: special legislation (US, H, U, R,Sl)
current legislation (F, CR,SW)
one century has no LTO plans now

**2.0 Current DB documentation requirements including design codes and standards**

**2.1 Design codes and standards used for structures and components**

4

Russian codes – WWER countries
US codes - other countries

in all countries the safety enhacement programs were carried out

**2.2 Maintenance practice**

scope, methods – based on safety importance of SSC
preventive vs. corrective maintenance
planning – long,- medium, - short, - term
approved programs, procedures
qualified personnel, QA programmes
use PSA – only few countries
no major differences

5

**2.3. Environmental qualification**

was not part of the design basis
became part of regulatory requirements later
mechanical and electrical components
mostly based on US practice
need to finalize running EQ programs

**2.4. QA practices**

part of legal requirements in all countries
mostly based IAEA recommendations, ISO or US practice
covers all safety related activities and items
no specific problem or differences

**2.5. FSAR update**

FSAR currently available in all SALTO countries
FSAR regularly updated in majority of countries

6

## 2.5. FSAR update

complete update in the framework of PSR
no major difference in layout and content of FSAR
the verified codes used (RELAP etc.), RG. 1.70, SRP – 0800
code validation for WWER necessary
possible differences in the quality of FSAR

## 2.6. Inservice inspection program (empty)

revrep descuibes the practice in countries of subgroup only
programs of ISI exists (vendor)
quality of ISI may be different (inspection tools, criteria)
inspection cycle for WWER shorter (4 years) than for other LWR to be performed by state – of - arts tools

7

## 2.7. Time limited aging analysis (TLAA)

TLAA or RLA performed in majority of NPPs
(RPV, components of primary or secundary circuit)
for non – replaceable, passive components
not in all countries as regulatory requirement for LTO
important prerequisite for LTO

## 3.0 Upgrading of DB including PSR

PSR applied in majority of countries (Based IAEA Safety Guide)
extensive safety upgrading programs performed
(particularly for WWERs in the framework of IAEA EBP)
severe accidents mitigation measures introduced (SAMGs)

8

## 4.0. Consideration given or activities planned or taken for LTO

strategic decision of utilities for LTO (5 – 20 years)
technical assessment
economical assessment
defailed program
two countries have licensed LTO

## 5.0. Existing programs directly related to LTO

Aging Management Programs (AMP) available
modernisation
measures vs. LTO programs
PSR after 10 years of operation applied in majority of countries (IAEA recommendation)

9

## 6.0. Research results and operating experience related to LTO

research programs underway
importance of international cooperation particularly for small countries (NEA, IAEA, EU, WANO)
application of IRS

## 7.0. References

important part of WG – 1 report
need to check for correctness and completeness

**Received responses from countries:**
mostly of „OK“ nature, but only a few comments
No response (Sweden, Ukraine)

10

# IAEA EBP On Long Term Operation Working Group 1 Recommendation

P.T. Kuo

September 2005

1

## 1.0 Laws and Regulations

A. Member state (MS) interested in long term operation should promulgate laws and regulations to stipulate technical requirement for long term operation of existing nuclear power plants.

B. Long term operation is defined as

"Operation goes beyond a defined term set forth by nation's laws and regulations, such as defined by a license term, design limits, standards, regulations, or similar licensing documents. Long term operation should be approved on the basis of activities that implement technical requirements established for maintaining safety during long term operation"

2

## 2.0 Current Licensing Basis Requirements Including Design Codes and Standards Used

A. An updated FSAR or other equivalent licensing documents that clearly describes current licensing basis or design basis requirements for current plant operation. As a minimum, description of the following subject should be included:
   a. Maintenance practice
   b. Aging Management
   c. Environmental qualification of electrical and mechanical equipment
   d. Quality assurance practice
   e. In-service inspection program
B. The design codes and standards used should be clearly identified.
C. Time limited aging analysis (TLAA) performed

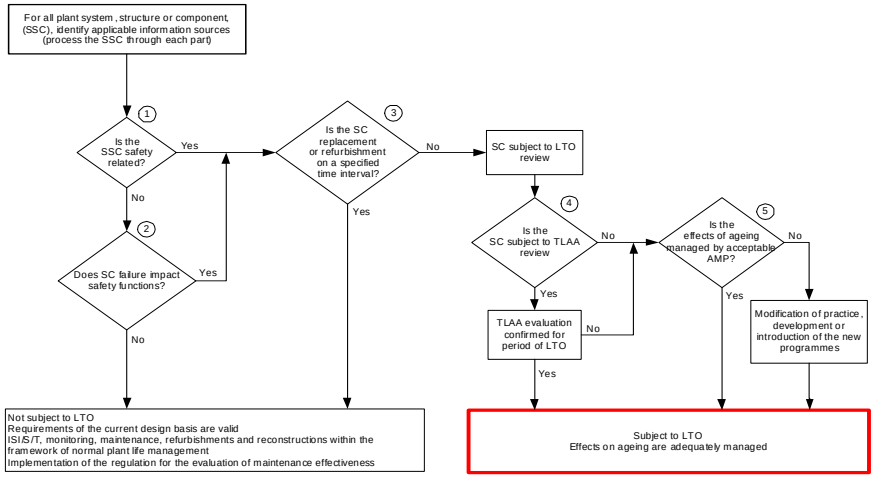
3

## 3.0 Past upgrading of design basis requirements performed including Periodic Safety Reviews (PSRs)

The scope and extend of continuous safety upgrade or verification process, such as measures coming from PSRs should be clearly identified and described in FSAR or other licensing documents

4

# For item 4.0.A




5

# For item 4.0.B

1. **Safety-related SSC**

SSCs that perform the following functions:

1. To ensure integrity of reactor coolant pressure boundary,
2. To ensure the capability to shut down the reactor and maintain it in a safe shutdown condition, and
3. To ensure offsite radioactive exposures less than, or comparable to, limits specified in the regulations of individual MS by preventive or mitigate measures.

**2. Non Safety SSCs whose Failure Impacts Safety Function**

The function of a safety system, structure or component may be compromised by failure of a non-safety related structure or component. One example is the failure of fire protection piping that leads to electric failure of an electrical panel that controls the current to a motor operated valve performing a safety engineered function, where the fire protection piping is a non-safety related component and the electrical panel is a safety component. The selection criterion includes but not limited to SSCs which perform a function to satisfy the requirements for the following:

Anticipated transient without scram (ATWS)
Station blackout (SBO)
Pressurized Thermal Shock (PTS)
Environmental Qualification (EQ)
Fire Protection (FP)

**3. Is the SC on a replacement Schedule or Refurbishment Schedule**

For SSCs are replaced based on a qualified life or specified time period; it is not necessary to include the SSCs in an aging management review or subject the SSCs to an Aging Management Program.

1. **Time Limited Aging Analysis (TLAAs)**

4. Time Limited Aging Analysis (TLAAs) are plant calculations and analyses that consider the effects of aging, involve time-limited assumptions defined by the current operating term, for example, 40 years; and involve conclusions or provide the basis for conclusions related to the capability of a system, structure, or component to perform its intended function(s).

5. Acceptable Ageing Management Programs

An acceptable ageing management program should contain the following attributes:

1. A defined program scope,
2. Identification of preventive actions or parameters to be monitored or inspected,
3. Detection of ageing degradation /effects,
4. Monitoring and trending including frequency and methodologies,
5. Pre-established acceptance criteria,
6. Corrective actions if a component fail to meet the acceptance criteria,
7. Confirmation that required actions have been taken,
8. Administrative controls that document the program's implementation and actions taken, and
9. Operating experience feedback.

6

## 4.0 Considerations given to, or activities planned or taken for, LTO

For long term operation, the following activities should occur:

A. Scoping and Screening evaluation
   See attached.

B. Review of plant aging management programs. An acceptable aging management program should contain the following elements:
   See the attached 9 elements.

c. Revalidate the TLAAs

7

## 5.0 Existing programs that are directly related to LTO

Existing plant maintenance or in-service programs may be credited toward long term operation provided that they can meet the 10 element requirements described in item 4.0.B

8

## 6.0 Available research results and operating experience that are directly related to LTO

A. Operating experience related to aging of structures and components should be systematically documented and shared with other MS.

B. Available research results should be systematically analyzed to its applicability to LTO and shared with other MS.

IAEA EBP ON SAFETY ASPECTS OF LONGTERM OPERATION
OF PRESSURIZED WATER REACTORS

# Discussion of WG 2
# Draft Final Report

Tom Taylor

Seattle, Washington
September 26-30, 2005

# WG 2 Draft Final Report

- Review Schedule
  - 09/22 Draft sent to WG members for Comment
  - 10/14 Deadline for WG Members Comments
  - 10/31 – Nov.2 Updated report presented to WG Members
  - 12/05 Report Submitted to IAEA for SC Review

# WG 2 Draft Final Report

- Draft Report Status
  - Report has Addressed All Section except Sections 3.1.8 to 3.1.10 Where Input is Needed
  - In Section 2.0 the Contents of
    - Summary…
    - Common Elements & Differences
    - Identification of Potential Safety Issues
    - Recommendations…

    Should be Discussed to ensure Common Approach

# WG 2 Draft Final Report

- Draft Report Status
  - The Actual Outline of Sections 3.2 to 3.6 Needs to be Reviewed – It may be better to Include a Summary in the Appropriate 3.1.X Section

# Issues to be resolved

- Common Elements and Differences Among Countries
  - Because there were no explicit criteria provided, in some cases the CIRs reported on each “subject” differently, and
  - Sometimes it was difficult to identify commonalities or differences
- Proposal
  - Use agreed Scoping process and International Best practice as comparison criteria
  - Request specific information from MS

# Issues to be resolved

- Identification of potential safety issues where additional regulatory development may be necessary
  - Why only regulatory development?
  - Regulators were not involved in drafting CIRs
  - Potential safety issues should be primarily addressed by licensee
- Proposal
  - Identification of potential safety issues

## Issues to be resolved

- Recommendations for regulatory approach for LTO
  - Why ask for regulatory approach?
  - Recommendations should be given to address identified potential safety issue-this provides a basis for making a regulatory assessment, the approach then follows from the assessment
  - Currently we do not know whose job it is going to be
  - It may be task for licensee, regulator or both to act

## Issues to be resolved

- Proposal
  - Recommendations for resolution of safety issues for LTO
  - Objective is WHAT should be solved rather than WHO is going to do it
  - Recommendations should be consistent with:
    - Summaries (that should provide information on current status of the affairs on the subject)
    - Commonalities and differences, and
    - Potential safety issues (identified based on scoping process results)

# Recommendations from WG2

- Scoping and Screening Criteria used by MS that adopt LTO should provide consistent set of SSCs
  - Recommend the Scoping and Screening Criteria & Tables be "Used in Pilot Study" to check that process works as Intended
- MS should agreed upon Criteria for Engineering Study that Identifies Degradation for SSCs subject to LTO review – This would result in Consistency Tables
  - Recommend that the Tables Developed by WG2 members be subject to Pilot Study to check that DM and Management programs are effective and appropriate

# Recommendations from WG2

- All Technical Issues Associated with LTO (Detection of DM, Characterization of DM, etc.) are not Solved – MS that adopt LTO should agree upon Technical Information Exchange Meetings
  - IAEA can Facilitate Meetings
- Not all MS Considering adopting LTO have Technical and Regulatory Infrastructure to ensure adequate Integrated Engineering
  - IAEA can Facilitate Development and Implementation of Network of experts to Support Technical and Regulatory needs of MS

IAEA EBP ON SAFETY ASPECTS OF LONG TERM OPERATION
OF PRESSURIZED WATER REACTORS

# Presentation on WG 3
# Draft Final Report

Alexander Duchac & Don Jarrell

Working Groups' Leaders and Secretaries
Seattle, Washington, USA
26-30 September 26 to 29, 2005

# WG 3 Draft Final Report

- Status
  - 09/05 Draft sent to MS for comments
  - 10/05 Reviewer's comments expected
  - 11/05 Comments resolution and report update
  - 11/05 Presentation of updated report on WG3 meeting
  - 12/05 Report submittal to IAEA and SC members

# WG 3 Draft Final Report

- Addressed all sections
- Numbered items not provided for currently incomplete sections
  - Summary…
  - Common elements & differences…
  - Identification of potential safety issues…
  - Recommendations…
- Content of those FOUR items should be discussed
- Feedback from MS on some subject still needed

# WG 3 Draft Final Report

- Recommended TOC generally followed
- Draft report did not number FOUR items
- Section 3 Operational approaches
  - It looks to be appropriate to put FOUR items under each subsection rather than to provide general summary for FOUR items at the end of section
- Numbering should be consistent in the report
  - Heading 1 Section title
  - Heading 2 Subsection title
  - Heading 3 + 4 FOUR items

# Issues to be resolved

- Summary of "Subject" from *Each Country* participating in SALTO Project
  - Should we provide Summary on specific subject from EACH country or on ALL countries that presented CIRs
- Proposal
  - Provide a Summary of "subject" from *all presented CIRs*
  - *Use title "SUMMARY"*

# Issues to be resolved

- Common Elements and Differences Among Countries
  - Because there were no explicit criteria provided, in some cases the CIRs reported on each "subject" differently, and
  - Sometimes it was difficult to identify commonalities or differences
- Proposal
  - Use agreed Scoping process and International Best practice as comparison criteria
  - Request specific information from MS

## Issues to be resolved

- Identification of potential safety issues where additional regulatory development may be necessary
  - Why only regulatory development?
  - Regulators were not involved in drafting CIRs
  - Potential safety issues should be primarily addressed by licensee
- Proposal
  - Identification of potential safety issues.

## Issues to be resolved

- Recommendations for regulatory approach for LTO
  - Why ask for regulatory approach?
  - Recommendations should be given to address identified potential safety issue – this provides a basis for making a regulatory assessment, the approach then follows from the assessment
  - Currently we do not know whose job it is going to be
  - It may be task for licensee, regulator or both to act

# Issues to be resolved

- Proposal
  - Recommendations for resolution of safety issues for LTO
  - Objective is WHAT should be solved rather than WHO is going to do it
  - Recommendations should be consistent with:
    - Summaries (that should provide information on current status of the affairs on the subject)
    - Commonalities and differences, and
    - Potential safety issues (identified based on scoping process results)

# Conclusions

- MS feedback on draft report
- MS additional information to draft the FOUR items
- MS feedback during next WG meeting to finalize the FOUR items
- Consensus on whether or not to reformat WG Final report to comply with QA requirements

## Potential safety issue

- A consistent approach to help defining the list of E I&C equipment considered in LTO as well as acceptance criteria of the scoping process is currently missing in most countries
  - Standard requirements and acceptance criteria to support the scooping process for selection of representative E I&C equipment for LTO is needed.

## Potential safety issue

- Harmonization of industrial standards and regulatory requirements applicable for AMP may be needed
- Gaps in knowledge, which need to be covered in future research:
  - Life assessment technology and NDE for physical properties altered by ageing
  - Improved monitoring techniques,
  - Reproduction of phenomena on test specimens,
  - Repair and degradation mitigation technologies.
  - Development of the a Aged Materials Database (toughness, mechanical properties of aged materials…)

## Potential safety issue

- Gaps in experience feedback namely making allowance for ageing at the design stage and monitoring ageing, the nuclear operator could then find itself torn between allowing operation to continue in degraded conditions or condoning outage for an indefinite extended period.

## Potential safety issue

- EQ requirements among member states align quite closely
- Maintaining accurate inventory of EQ for E I&C equipment and replacing it according to its expiration schedule is an issue
  - presents both a logistical and a financial burden to the utilities
- Regulator for this reason should be exceptionally attentive in ensuring compliance with replacement schedules.

## Potential safety issue

- A comprehensive re-qualification programs for E I&C equipment should be implemented for the equipment at the plant designed according to earlier standards that aimed at:
  - Getting missing information on whether the equipment can perform as expected by the design in the accident under accidental conditions
  - If the information is not available from other sources, re-qualification program should include accelerated thermal and radiation ageing to learn about the equipment Ageing prediction

## Potential safety issue

- Minimal scope of EI&C equipment for LTO to be subject of functional testing as well as minimum requirements for scheduling, testing methods, procedures and testing devices.
- The scoping methodology for E I&C equipment provided in Annex 1 is recommended as a consensus technique developed by all working groups from the member states.

## Potential safety issue

- While most regulators encourage the development and use of diagnostic and prognostic technologies, many have been slow to accept their accuracy as acceptable proof of system or component health
- Laboratory developments are difficult to implement in operating nuclear plants.

## Potential safety issue

- A comprehensive re-qualification programs for the E I&C at the plant designed according to earlier standards should be implemented that is aimed at getting missing information on whether the equipment can perform as expected by the design under accidental conditions.
- TLAA appears to be a good example to be followed by LTO applicants in order to demonstrate qualified life of EI&C equipment for LTO.

# WG 4 DRAFT Final Report

(development-history, overview, open issues, finalization plan, deviations from the original TOC, consistency with other WGs final reports)

Working Groups' Leaders and Secretaries, Seattle, Washington, USA
26-30 September 26 to 29, 2005

## History

- Meeting in January, review of CIRs
- Draft of the draft of WG4 Report
- WG4 Meeting in May 2005
- Drafting
- Development of the tables, which generalize the CIR experience and could be used as common basis or recommendation
- Rewriting – going on
- Sending to WG4 members first week of October
- WG4 Meeting October 2005
  - Final review and improvements

Working Groups' Leaders and Secretaries, Seattle, Washington, USA
26-30 September 26 to 29, 2005


# 1 APPLICABLE LAWS SPECIFIC TO STRUCTURES AND STRUCTURAL COMPONENTS FOR LONG TERM OPERATION

- 1.1 SUMMARY OF LAWS FROM EACH COUNTRY PARTICIPATING IN SALTO
- 1.1.1SAFETY CLASSIFICATION AND CATEGORISATION
- 1.1.2AGEING MANAGEMENT PROGRAMS
- 1.2 COMMON ELEMENTS AND DIFFERENCES AMONG APPROACH TO LTO
- 1.3 IDENTIFICATION OF POTENTIAL SAFETY ISSUES WHERE ADDITIONAL REGULATORY DEVELOPMENT MAY BE NECESSARY
- 1.4 RECOMMENDATIONS FOR LEGAL APPROACH TO LTO

Working Groups' Leaders and Secretaries, Seattle, Washington, USA
26-30 September 26 to 29, 2005

## Comments on Chapter 1

- It would be better to delete the chapter except of a few paragraphs on the structure specific regulation and related recommendation
- Misunderstanding the regulation
  - No clear understanding of WG tasks
  - No clear understanding of basic principles of the regulation
    - AM part of CLB
    - Review of the existing (if exists) AMP for LTO is very important. This is the general practice:
      - PSR review of the plant status and AM + EQ
      - LR: IPA, review of AMP, TLLA
      - In some countries both



## 2 REGULATORY REQUIREMENTS APPLICABLE TO LTO

- 2.1 CRITERIA FOR SELECTION OF STRUCTURES AND STRUCTURAL COMPONENTS WITHIN THE SCOPE OF LONG-TERM OPERATION (LTO) PROGRAM
- 2.1.1PROCEDURES FOR SELECTION OF STRUCTURAL COMPONENTS IN DIFFERENT COUNTRIES
- 2.1.2COMMON FEATURES AND DIFFERENCES IN SELECTION PROCEDURES
- 2.1.3IDENTIFICATION OF POTENTIAL SAFETY ISSUES REQUIRING ADDITIONAL STUDIES
- 2.1.4

## Comments on Chapter 2.1

- Could be improved
- Scope: clear message
  - Safety + seismic classified + non-safety should be included into scope because of interactions
  - (PLiM/LTO should cover the most important non-safety SSC – it is not a safety issue, although some countries consider is as very important; In some countries the importance of the reconstruction projects are not correctly understood.)
  - Interesting example of Russia for classification of structures – generate confusion, not recommendable
- Type-specific tables are developed by WG4; generalization of CIR;
- The tables might be recommended as minimum scope



## 2 REGULATORY REQUIREMENTS APPLICABLE TO LTO

- 2.2 AGEING MANAGEMENT PROGRAMMES-ORGANIZTIONAL, MANAGEMENT ISSUES AND INTERFACES WITH OTHER PLANT PROCESSES
- 2.2.1SUMMARY OF AGEING MANAGEMENT PROGRAMMES
- 2.2.2COMMON ELEMENTS AND DIFFERENCES OF AGEING MANAGEMENT PROGRAMMES
- 2.2.3IDENTIFICATION OF POTENTIAL SAFETY ISSUES WHERE ADDITIONAL DEVELOPMENT MAY BE NECESSARY
- 2.2.4RECOMMENDATIONS

## Comments on Chapter 2.2

- Could not be improved;
- It seems to be a smooth text, but it should be totally rewritten
- Misunderstanding and Misinterpretation of country practices and even the content of IAEA Safety report No 15

- Recommendations
  - To consider AM as part of CLB - trivial
  - To develop consensus based criteria for AMP (it is given), develop interpretation of attributes to ensure the level of safety in each case
  - To develop consensus based, state-of-the-art Guideline for AMP
  - Highlight structural specific aspects, if any (Task for WG4 October Meeting!)



## Attributes of acceptable AMP

- 1. A defined program scope (TABLE)
- 2. Identification of preventive actions or parameters to be monitored or inspected (TABLE)
- 3. Detection of ageing degradation /effects (TABLE)
- 4. Monitoring and trending including frequency and methodologies (Table)
- 5. Pre-established acceptance criteria
- 6. Corrective actions if a component fail to meet the acceptance criteria
- 7. Confirmation that required actions has been taken
- 8. Administrative controls that document the program's implementation and actions taken, and
- 9. Operating experience feedback

## Missing part of Chapter 2

- DB and Configuration management
- Generic issue, not LTO specific, but lacking CM could be also an LTO issue



## 3 OPERATIONAL APPROACHES APPLICABLE TO LTO

- 3.1 REFERENCE DEGRADATION MECHANISMS
- 3.1.1 SUMMARY OF APPROACHES TO THE SELECTION OF DEGRADATION MECHANISMS IMPORTANT FOR LTO
- 3.1.2 COMMON ELEMENTS AND DIFFERENCES
- 3.1.3 REFERENCE-DEGRADING MECHANISMS
- 3.1.4 RECOMMENDATIONS TO THE SCIENTIFIC COMMUNITY FOR FURTHER DEVELOPMENT AND RESEARCH NEEDS

Working Groups' Leaders and Secretaries, Seattle, Washington, USA
26-30 September 26 to 29, 2005

## Comments on Chapter 3.1

- As per text the 2nd worst chapter
- Text could not be improved, it has to be rewritten.

- The table developed by WG4 has a real value.
- It is a generalization of CIR.
- It will be reviewed by WG4 Meeting in October
- It might be recommended as degradation mechanisms to be considered



## 3 OPERATIONAL APPROACHES APPLICABLE TO LTO

- 3.2 MONITORING, SURVEILLANCE AND INSPECTIONS
- 3.2.1SUMMARY OF MS&I PRACTICES FROM EACH COUNTRY

- 3.2.2COMMON ELEMENTS AND DIFFERENCES AMONG COUNTRY MS&? PRACTICES
- 3.2.3IDENTIFICATION OF POTENTIAL SAFETY ISSUES WHERE ADDITIONAL DEVELOPMENT MAY BE NECESSARY
- 3.2.4RECOMMENDATION FOR REGULATORY AND OPERATIONAL APPROACHES

## Comments on Chapter 3.2

- Could be improved;
- Recommendations as written in the draft



## Recommendations 3.2

- Majority of the current MS & I procedures follows common practice for routine operation of plant without accentuation of specific deviations for long-term operation beyond the framework of the original proposed lifetime. The regulatory bodies of the member states should establish the general requirements. The nuclear power plant operator have to prepare the detail operating procedures. The detail methods for the MS & I depend on the structural design of individual buildings as well as on the ambient conditions. Thus it is impossible to develop the generally valid detail procedures. The IAEA should provide general recommendations for the long-term nuclear power plant operation in order to assist the national regulatory bodies. From the point of the MS & I view such procedure could comprise the following information and principles for monitoring of the building condition regarding its categorization for the long-term operation:
- The identified defects categorization from the point of view of the long-term operation and its impact on nuclear safety
- Recommendations for organizational arrangements and provision of information system
- Relations to other activities from the point of view of the long-term operation.
- NPP operators should prepare the detail procedures covering the scope selected for LTO. (The structural components/commodities have to be included too.) It has to be based on their own operational experiences and existing MS&I programs, credit has to be paid if they are adequate
- The IAEA should promote information transfer and provide general recommendations for long term NPP operation in order to assist the IAEA MS

## 3 OPERATIONAL APPROACHES APPLICABLE TO LTO

- 3.3 MAINTENANCE PRACTICE – AGEING MITIGATION MEASURES AND REPAIR TECHNOLOGY
- 3.3.1SUMMARY OF MAINTENANCE PRACTICES FROM EACH COUNTRY
- 3.3.2COMMON ELEMENTS AND DIFFERENCES OF MAINTENANCE PRACTICES
- 3.3.3IDENTIFICATION OF POTENTIAL SAFETY ISSUES WHERE ADDITIONAL DEVELOPMENT MAY BE NECESSARY
- 3.3.4RECOMMENDATIONS FOR REGULATORY AND OPERATIONAL APPROACHES



## Comments on Chapter 3.3

- Could be improved;
- Recommendation as written in the draft

## Recommendations 3.3

- The area of the operating maintenance is usually well resolved in the procedures of the individual national regulatory bodies as well as in the detail procedures of nuclear power plant operators. However in the majority of instances the definition of the specific deviations and recommendations from the point of view of the long-term operation beyond the framework of the design lifetime is missing again. The IAEA recommendation could comprise the basic general principles issued in order to assist development of the national procedures in individual member states. This IAEA general recommendation could comprise the following information:
- - The general requirements for provision of maintenance and repairs from the point of view of the long-term operation
- - Classification of the general types of damage or defects of concrete and steel structures with an overview of possible ways for their repairs
- - Recommendation for organizational arrangement
- - Relations to other activities from the point of view of the long-term operation.
- The national regulatory body should establish the general recommendations and requirements for maintenance and repairs. However the area of repairs depends on the structural design of individual buildings and it is difficult to standardize this area.
- NPP operators should prepare the detail procedures based on their own operational experiences and existing maintenance practices, credit has to be paid if they are adequate
- The IAEA should promote information transfer and provide general recommendations for long term NPP operation in order to assist the IAEA MS



## 3 OPERATIONAL APPROACHES APPLICABLE TO LTO

- 3.4 ASSESSMENT TECHNIQUES FOR EXISTING STRUCTURES. TREND ANALYSIS AND EVALUATION OF SAFETY MARGIN. PRACTICES USED TO CONTROL DESIGN BASIS.
- 3.4.1SUMMARY OF ASSESSMENT TECHNIQUES AND TREND ANALYSES APPROACHES FROM EACH COUNTRY.
- 3.4.2COMMON ELEMENTS AND DIFFERENCES
- 3.4.3IDENTIFICATION OF POTENTIAL SAFETY ISSUES WHERE ADDITIONAL DEVELOPMENT MAY BE NECESSARY
- 3.4.4RECOMMENDATIONS FOR REGULATORY AND OPERATIONAL APPROACHES

## Comments on Chapter 3.4

- Could be improved;
- Recommendation as written in the draft



## Recommendations 3.4

- Assessment of the ultimate load-bearing capacity of the real structure damaged by impact of the degrading factors is very demanding task. Also the prediction of trends of further progress for whole period of extended lifetime is equally difficult. The procedures of the national regulatory bodies or the IAEA recommendations can comprise the general principles only. The proper method for assessment of the safety margin of structure and the prediction of trends depends on experience, available software and input data quality. Also the OECD-NEA participates in this area arranging several workshops focused on these problems. The IAEA could assist this area by organizing cooperation and information exchange on the international level.
- Each member state should prepare procedures based on their own operational and international experiences. These assessment techniques, developed and implemented by the utilities, should be approved by the regulators.

## 4 COMPILATION OF A LIST OF REFERENCE

- It has to be homogenized and reviewed



## Questions

- Shall we repeat the descriptive part of CIR country by country?
- Shall we follow the QA prescriptions if the countries did not?
- Could we make explicit recommendations like it is done in the tables developed by WG4 on the basis of country practices?

# Recommendations of the WG4

Every important recommendation
was already mentioned

## Recommendations on Chapter 1

- We have the feeling that no clear understanding of basic principles of the regulation
  - **AM part of CLB**
  - **Review of the existing (if exists) AMP for LTO is very important. This is the general practice:**
    - **PSR review of the plant status and AM + EQ**
    - **LR: IPA, review of AMP, TLLA**
    - **In some countries both**

## Recommendations on Chapter 2.1

- Scope: clear message
  - Safety + seismic classified + non-safety should be included into scope because of interactions; items easy to forget (supports, etc.)
  - (PLiM/LTO should cover the most important non-safety SSC – it is not a safety issue, although some countries consider is as very important; In some countries the importance of the reconstruction projects are not correctly understood.)
  - Interesting example of Russia for classification of structures – generate confusion, not recommendable
- Type-specific tables are developed by WG4; generalization of CIR;
- The tables might be recommended as minimum scope

## Recommendations on Chapter 3.1 (AMP)

- The table developed by WG4 has a real value.
- It is a generalization of CIR.
- It will be reviewed by WG4 Meeting in October
- It might be recommended as degradation mechanisms to be considered (it could be part of guidance document)

## Recommendations 3.2 (MS&I)

- **The IAEA may provide general recommendations for the long-term nuclear power plant operation in order to assist the national regulatory bodies. From the point of the MS & I view such procedure could comprise the following information and principles for monitoring of the building condition regarding its categorization for the long-term operation:**
  - **The identified defects categorization from the point of view of the long-term operation and its impact on nuclear safety**
  - **Recommendations for organizational arrangements and provision of information system**
  - **Relations to other activities from the point of view of the long-term operation.**
- **NPP operators should prepare the detail procedures covering the scope selected for LTO. (The structural components, commodities have to be included too.) It has to be based on their own operational experiences and existing MS&I programs, credit has to be paid if they are adequate**
- **The IAEA may promote information transfer and provide general recommendations for long term NPP operation in order to assist the IAEA MS**

## Recommendations 3.3 (Maintenance)

- **The IAEA recommendation could comprise the basic general principles issued in order to assist development of the national procedures in individual member states. This IAEA general recommendation could comprise the following information:**
  - **The general requirements for provision of maintenance and repairs from the point of view of the long-term operation**
  - **Classification of the general types of damage or defects of concrete and steel structures with an overview of possible ways for their repairs**
  - **Recommendation for organizational arrangement**
  - **Relations to other activities from the point of view of the long-term operation.**
- **The national regulatory body should establish the general recommendations and requirements for maintenance and repairs. However the area of repairs depends on the structural design of individual buildings and it is difficult to standardize this area. NPP operators should prepare the detail procedures based on their own operational experiences and existing maintenance practices, credit has to be paid if they are adequate**
- **The IAEA should promote information transfer and provide general recommendations for long term NPP operation in order to assist the IAEA MS**

# Recommendations 3.4 (assessment techniques)

- Assessment of the ultimate load-bearing capacity of the real structure damaged by impact of the degrading factors is very demanding task. The IAEA could assist this area by organizing cooperation and information exchange on the international level.
- Each member state should prepare procedures based on their own operational and international experiences. (EU and also the OECD-NEA have valuable information which could be used.) These assessment techniques, developed and implemented by the utilities, should be approved by the regulators.