IAEA Activities in LTO area

SALTO Peer Review Safety Service

Robert Krivanek – R.Krivanek@iaea.org
Project manager for LTO
Division of Nuclear Installation Safety

IAEA
International Atomic Energy Agency

Definition of Long Term Operation

Operation beyond an established timeframe set forth by, for example, licence term, design, standards, license and/or regulations, which has been justified by safety assessment, with consideration given to life limiting processes and features for systems, structures and components.

IAEA

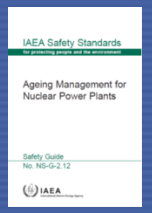
Challenges of safe long term operation

1. Unclear national energy strategy
   a. Difficult to decide on investment for LTO
   b. Lack of rules for LTO preparation
2. Routine operation of old units
   a. Difficult to acquire young engineers
   b. The best personnel attracted to operation of new modern plants
3. Post-Fukushima situation
   a. Change of political and public acceptance
   b. New safety requirements

IAEA

How is IAEA supporting a safe LTO of NPPs?

1. Establishment of related IAEA Safety Standards



2. Fostering information exchange and establishing databases
   a. IGALL Programme (second part of presentation)
   b. AM and LTO workshops
   c. SALTO methodology and experience transfer workshops
   d. CRP – Coordinated Research Projects

3. Provision of peer review service (**SALTO* peer review**) to assist Member States in application of related Safety Standards

* SALTO – Safety Aspect of Long Term Operation

IAEA

Benefits of SALTO Review Service for NPPs

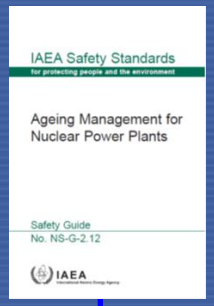
1. Review of compliance with IAEA standards and international best practices
2. Recommendations for improvement to reach the compliance
3. Opportunity for NPP staff to discuss their practices with experienced experts
4. Strengthening of public confidence to NPP
5. Support in licensing renewal procedure (or extension of operational permission procedure)

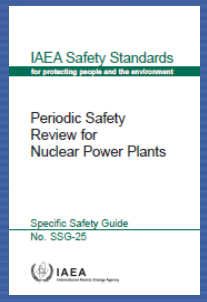
IAEA

Safety Standards on Ageing Management and LTO

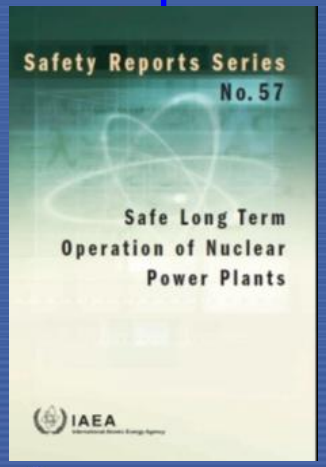
SSR-2/2: Commissioning and Operation

NS-G-2.12 Safety Guide on Ageing Management

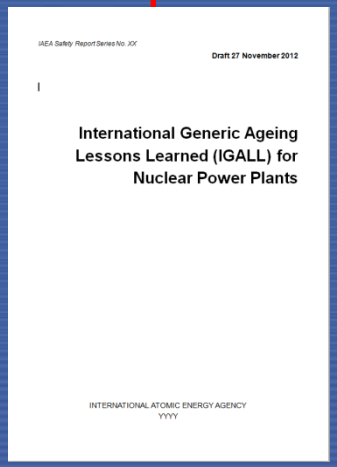




SSG-25 Safety Guide on PSR



SRS No 57 Safe LTO

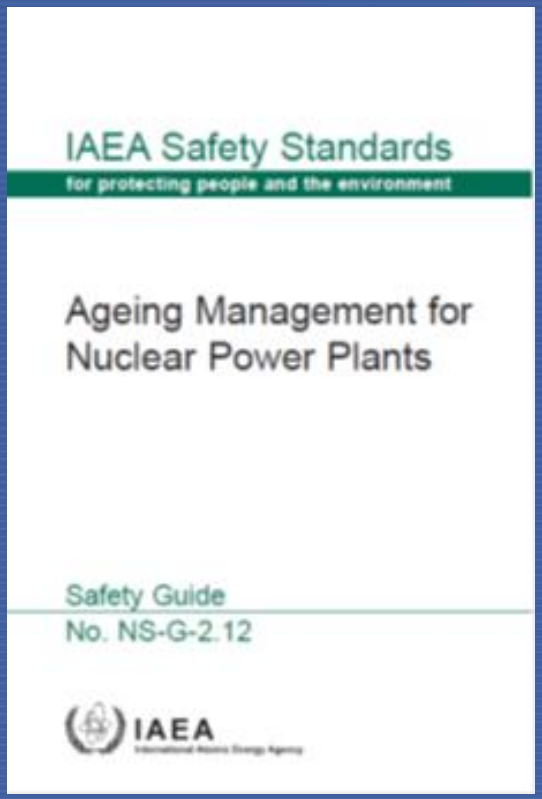


SRS DD1085 IGALL Report

SS No 17 SALTO Guidelines

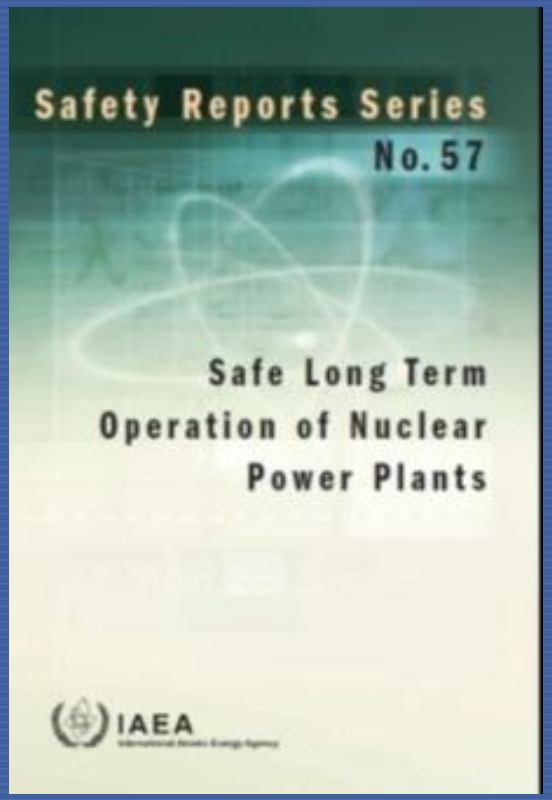
IAEA

Safety Guide on Ageing Management



- **Objective**
  - To provide a set of guidelines and recommendations for managing ageing of Systems Structures and Components (SSCs) important to safety in nuclear power plants.
- **Scope**
  - SSCs in NPPs.
  - Mainly focused on physical ageing but also includes management of obsolescence.
- Published in 2009

Safety Report No. 57
"Safe Long Term Operation of Nuclear Power Plants"

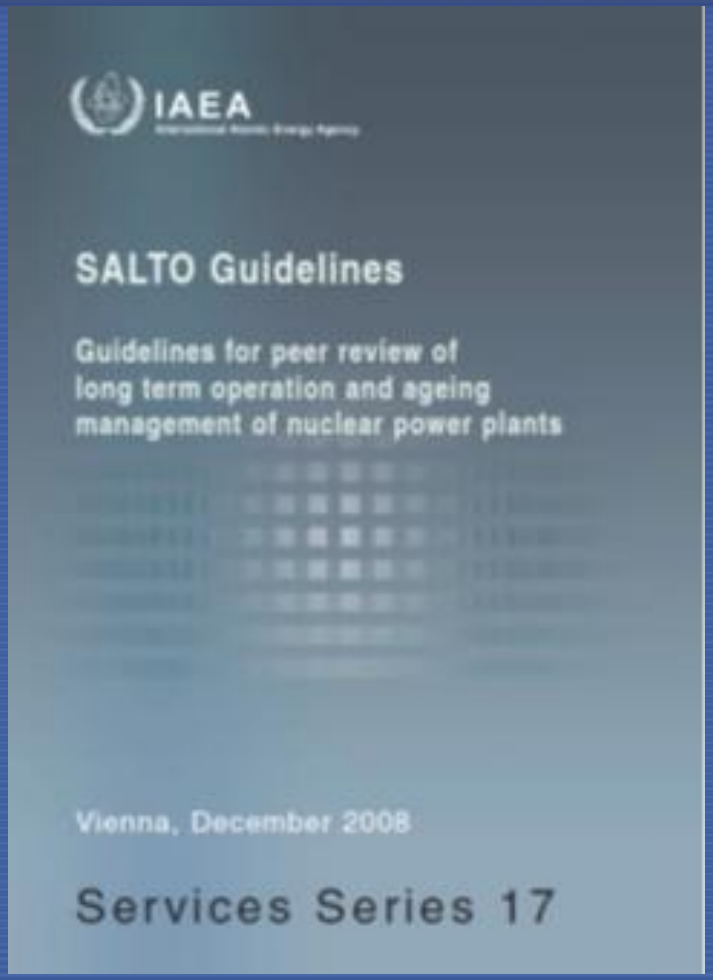


- Key elements from the EBP SALTO final reports and provide guidance on LTO
- Main basis of the SALTO peer review
- Published in 2008

- Table of contents
  1. INTRODUCTION
  2. OVERVIEW
  3. LTO FEASIBILITY
  4. SCOPING AND SCREENING
  5. ASSESSMENT AND MANAGEMENT OF STRUCTURES AND COMPONENTS FOR AGEING DEGRADATION FOR LTO
  6. REVALIDATION OF SAFETY ANALYSES THAT USED TIME LIMITED ASSUMPTIONS
  7. DOCUMENTATION
  8. REGULATORY OVERSIGHT

IAEA

SALTO peer review - guideline



- Aims to provide a basic structure and common reference across the various areas covered by a SALTO peer review mission
- Initially developed for SALTO peer review team members, but also provides guidance to a host organization in preparation to a peer review mission
- Edition 2013 will be available soon

Steps of the SALTO Peer Review Service

Phase 0: Workshop/seminar on IAEA safety standards and SALTO methodology (optional)

Phase 1: NPP in preparation for LTO – programme, assessment, action items scheduling

Step 1: Preparatory Meeting 1

Step 2: Pre-SALTO Mission*

(performed 10-2 years before entering LTO period)

Phase 2: NPP ready for LTO

Step 3: Preparatory Meeting 2

Step 4: SALTO Mission**

(performed 2-0 years before entering LTO period)

Step 5: Follow-up SALTO Mission

*Originally called „Limited scope SALTO mission“

**Originally called „Full scope SALTO mission“

Time schedule of the SALTO Peer Review Service

Step 1: Preparatory Meeting 1	2-3 days	1st year
Step 2: Pre-SALTO Mission	8 days	6-9 months thereafter
Step 3: Preparatory Meeting 2	2-3 days	3rd-5th year
Step 4: SALTO Mission	9 days	6-9 months thereafter
Step 5: Follow-up SALTO Mission	4 days	18-24 months thereafter

IAEA

Standard SALTO Peer Review scope

- Area A - Organisation and functions, current licensing basis, configuration/ modification management;
- Area B - Scoping and screening and plant programmes relevant to LTO;
- Area C - Ageing management review, review of AMPs and related TLAAs for mechanical components;
- Area D - Ageing management review, review of AMPs and related TLAAs for electrical and I&C components;
- Area E - Ageing management review, review of AMPs and related TLAAs for civil structures;
- Area F - Human resources, competence and knowledge management for LTO.

SALTO Peer Review – Working with Counterparts

Entrance meeting

Daily interviews

Plant walk-downs

Exit meeting

IAEA

SALTO Peer Review Services 2005 - 2012

SALTO peer review missions performed:

- Paks NPP – Pre-SALTO and SALTO - 7x (Hungary, 2005 – 2011)
- Karachi NPP – Pre-SALTO (Pakistan, 2007)
- South Ukraine NPP – Pre-SALTO (Ukraine, 2007)
- Kori 1 NPP – SALTO (Republic of Korea, 2007)
- Dukovany NPP – Pre-SALTO (Czech Republic, 2008)
- Borssele NPP - Pre-SALTO (the Netherlands, 2009)
- Kori 1 NPP – SALTO Follow-up (Republic of Korea, 2010)
- Koeberg NPP - Pre-SALTO (South Africa, 2011)
- Dukovany NPP – SALTO Follow-up (Czech Republic, 2011)
- Borssele NPP – SALTO + SALTO Follow-up (the Netherlands, 2012)
- Wolsong 1 NPP – SALTO (Republic of Korea, 2012)
- Tihange 1 NPP – Pre-SALTO (Belgium, 2012)

Planned SALTO missions for 2013 - 2014

Country	Type	Date	Plant
Hungary	SALTO follow-up	April 2013	Paks 1-4
Armenia	Pre-SALTO	April 2013	Armenian 2
Brasil	Pre-SALTO	November 2013	Angra 1
Netherlands	SALTO follow-up	February 2014	Borssele
Sweden	Pre-SALTO	March 2014	Ringhals 1, 2
South Korea	SALTO follow-up	April 2014	Wolsong 1
Belgium	SALTO	October 2014	Tihange 1
Czech Rep.	SALTO	November 2014	Dukovany 1-4

IAEA

SALTO missions foreseen for 2015 - 2016

Country	Type	Date	Plant
Mexico	Pre-SALTO	March 2015	Laguna Verde
Armenia	SALTO follow-up	July 2015	Armenian 2
Brasil	Pre-SALTO	November 2015	Angra 1
Bulgaria	Pre-SALTO	November 2015	Kozloduy 5&6
Sweden	SALTO	1.Q 2016	Ringhals 2
Czech Rep.	SALTO follow-up	2016	Dukovany 1-4
Sweden	SALTO	4.Q 2016	Ringhals 1
Belgium	SALTO follow-up	2016	Tihange 1
Armenia	SALTO	March or December 2016	Armenian 2

IAEA

SALTO Peer Review Services 2005 - 2012

Currently implemented SALTO related activities:

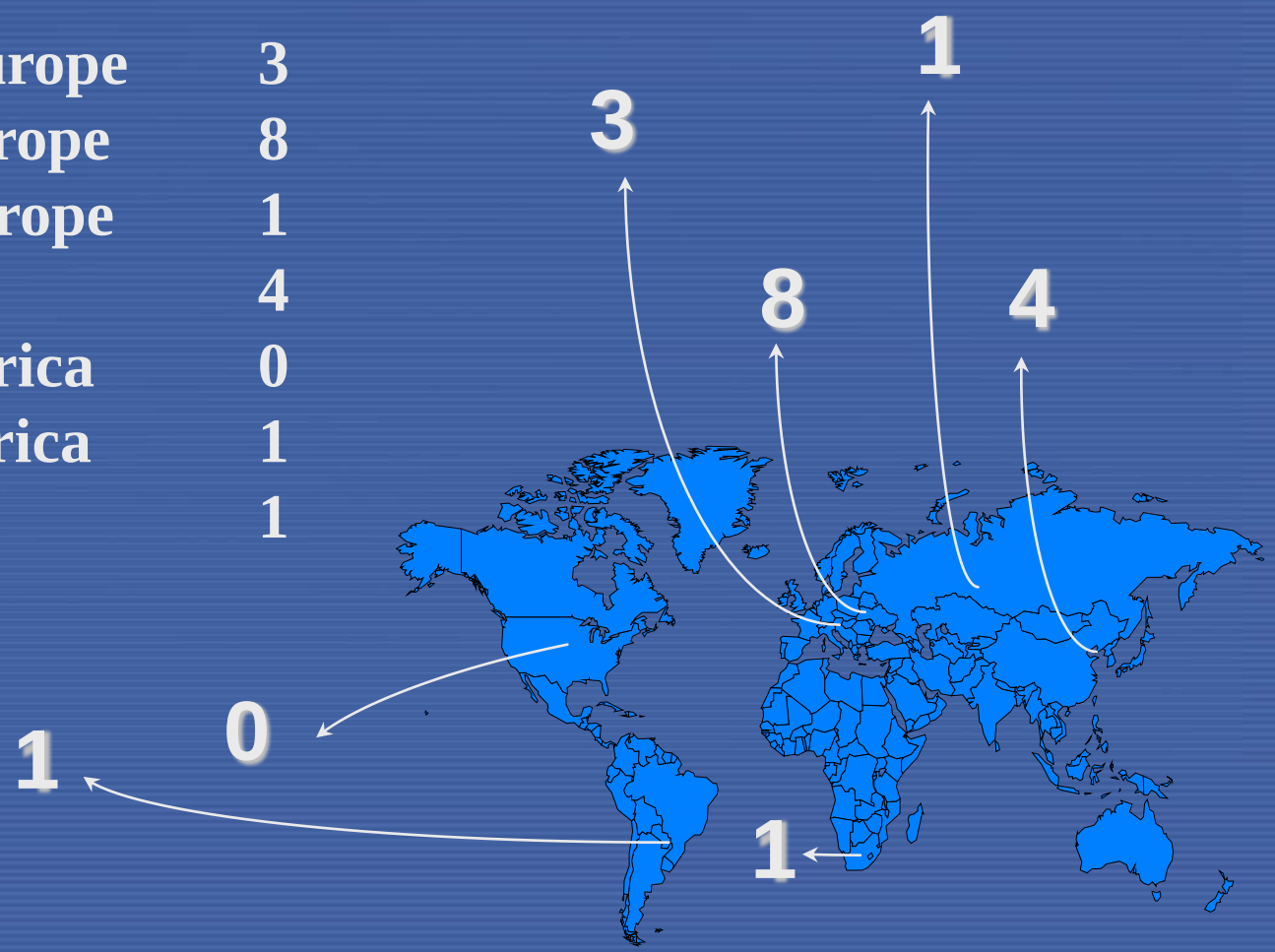
- Armenia: AM and Remaining Life Time Assessment of ANPP`s SSC – (2012 – 2015)
- Bulgaria: Assistance in Preparation of Life Time Extension Programme of Units 5 & 6 of Kozloduy NPP – (2012 – 2013)
- **Mexico&Brazil: Enhancing PLIM and Safety Culture Practices in the NPPs of Latin America - (2013 – 2016)**

IAEA

SALTO missions 2005 - 2013

18 SALTO missions:

Western Europe	3
Central Europe	8
Eastern Europe	1
Asia	4
North America	0
South America	1
Africa	1



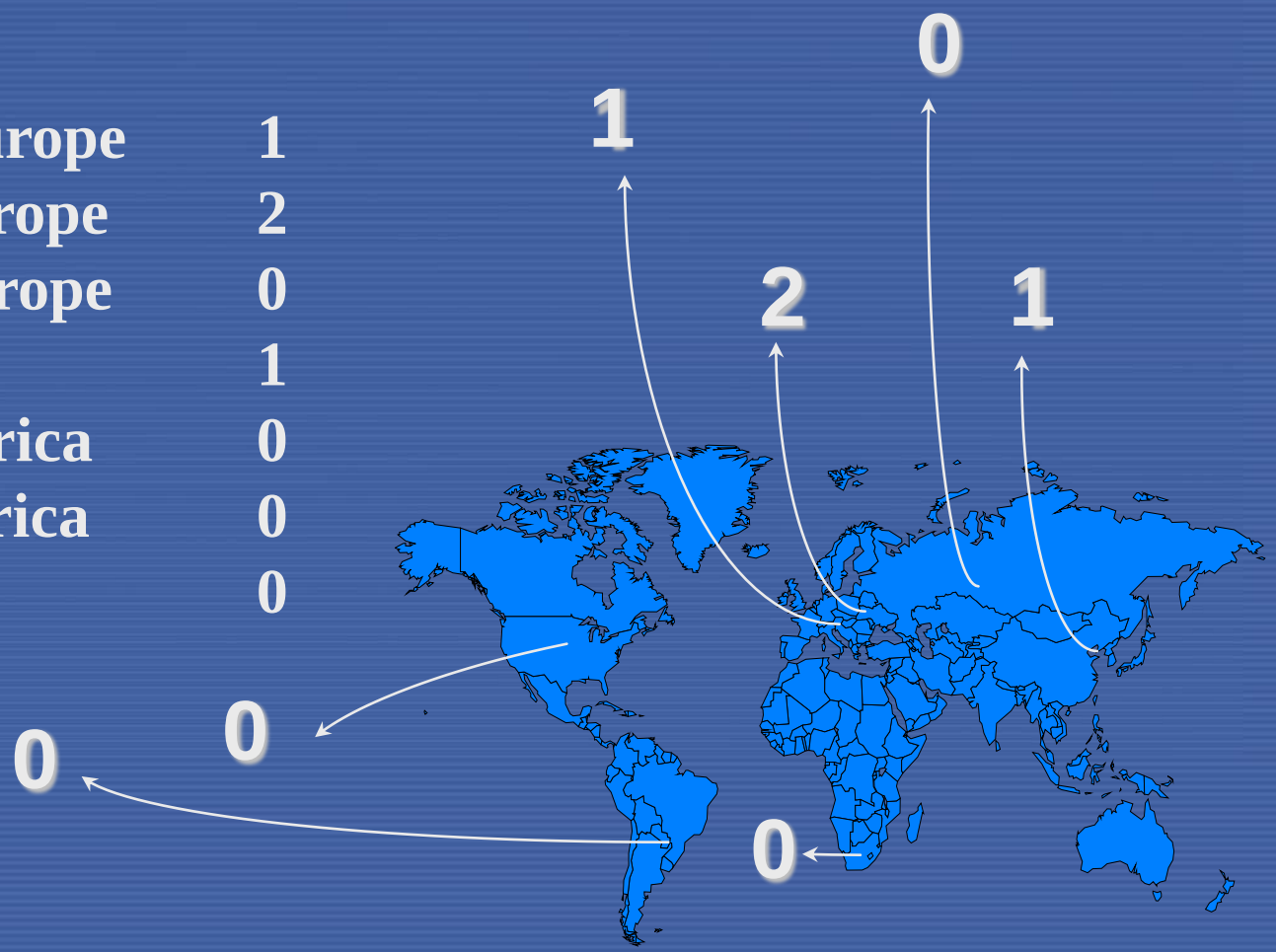
IAEA

SALTO follow-up missions 2010* - 2013

4 SALTO follow-up missions:

Western Europe	1
Central Europe	2
Eastern Europe	0
Asia	1
North America	0
South America	0
Africa	0

* Provided since 2010.

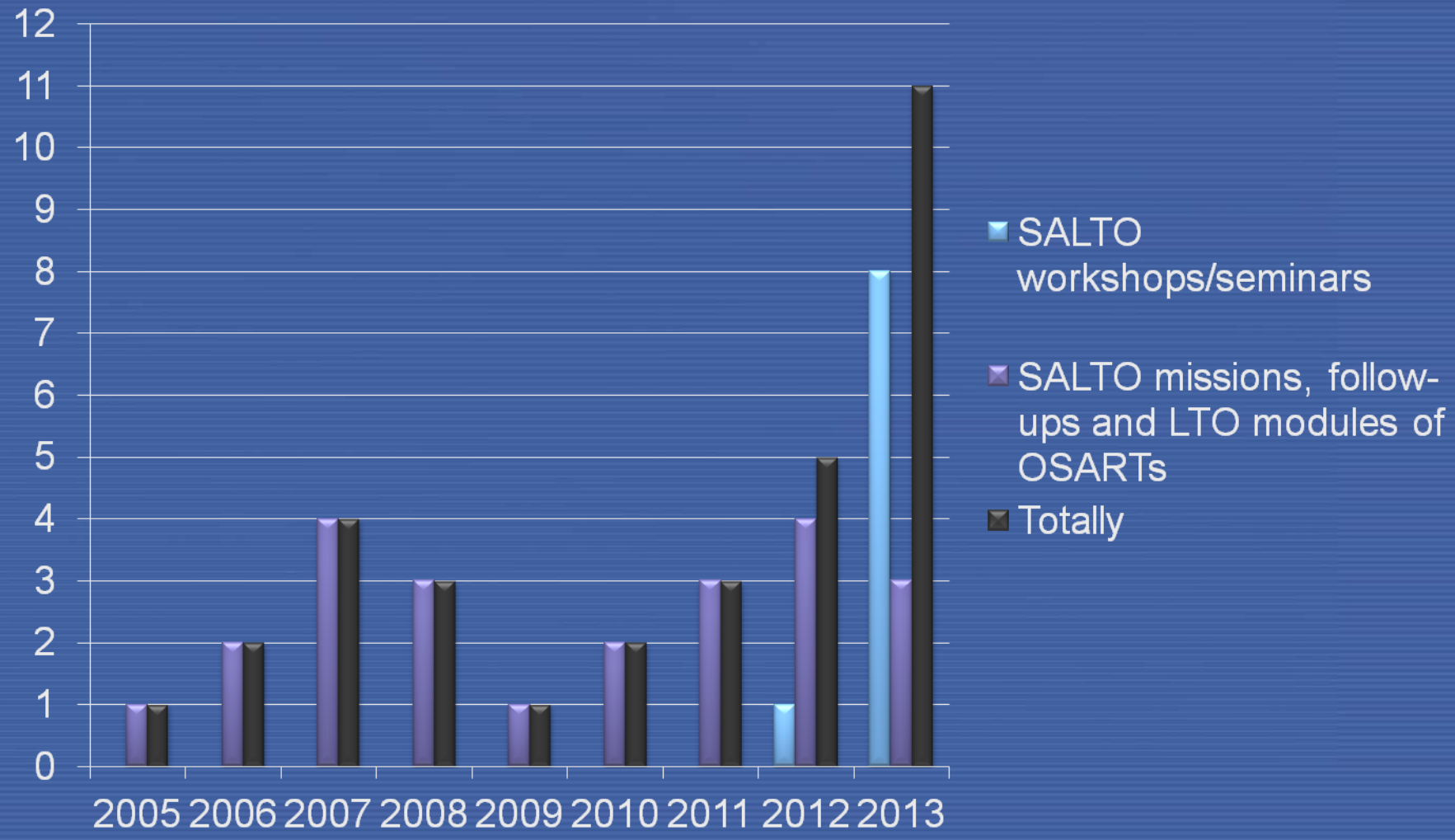


IAEA

SALTO workshops/seminars in 2013

Country	Type	Date	Plant
China	SALTO workshop	March 2013	Qinshan 1
Mexico	SALTO workshop	May 2013	Laguna Verde
Bulgaria	SALTO workshop	June 2013	Kozloduy 5&6
Canada	SALTO workshop	July 2013	CNSC
Sweden	SALTO workshop	September 2013	Ringhals 1&2
China	SALTO workshop	October 2013	Daya Bay
Japan	SALTO workshop	December 2013	Multiply NPPs
Sweden	SALTO workshop	December 2013	Oskarshamn

SALTO missions and workshops/seminars



IAEA

Changes in SALTO peer review service in 2013

SALTO Guidelines Edition 2013 prepared:

- Standard review areas
- New area “Human resources, competence and knowledge management for LTO” supplemented
- Unified mission schedule
- SALTO workshops/seminars implemented
- OSART methodology and terminology used whenever possible
- Fundamental overall problem and safety consequence identified in each issue
- Only one recommendation or suggestion per issue
- IGALL Safety Report incorporated

IAEA

IAEA Activities in LTO area

IGALL Programme

Robert Krivanek – R.Krivanek@iaea.org
Project manager for LTO
Division of Nuclear Installation Safety

IAEA
International Atomic Energy Agency

Objectives of IGALL Programme

- Establishment of a state-of-the-art IGALL report, as guidance on recommendable ageing management programmes.
- Basis for implementation of recommendable AMPs for NPPs with diverse technologies: PWR, BWR, WWER, CANDU, PHWR.
- The IGALL report would be updated and upgraded periodically at least every 5 years.
- Perceived as a “living document”.
- Fundamental document in supporting a systematic approach to managing ageing of a variety of structures or components as described in the Safety Guide NS-G-2.12.

IAEA

IGALL – Phase 1

Scoping Meeting/ Briefing for PMs of the MSs

1st – 2nd Q 2010

Launching of the Programme

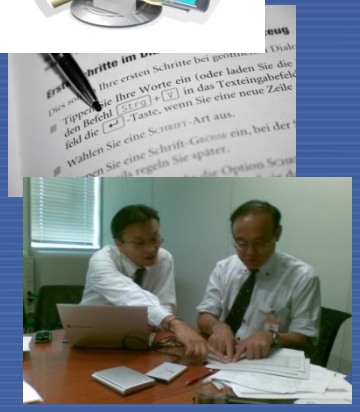
Organization set-up

Steering Group

Working Groups

2nd -3rd Q 2010

Progress of the programme in accordance with time schedule



2011-12

IGALL Safety Report

4th Q 2013

operators

regulators

vendors

IAEA

International Generic Ageing Lessons Learned Programme (IGALL)

Degradation mechanisms + ageing effects

PWR

BWR

CANDU

IGALL

Catalogue of generic AMPs and TLAAs

- **Collection of „proven“ AMPs***
- **Collection of typical TLAAs***
- **Identifies relevant AMPs and TLAAs for safety SSCs**
- **9 attributes of AMPs**
- **i, ii, iii solutions of TLAAs**

OPERATORS

REGULATORS

DESIGNERS

NEWCOMERS
capacity building

*** AMPs – Ageing Management Programmes**

TLAAs – Time Limited Ageing Analysis

IAEA

IGALL Programme

Participation of Member States as for 2013

- Argentina
- Belgium
- Brazil
- Canada
- China
- Czech Republic
- France
- Germany
- Hungary
- India
- Japan
- Mexico
- The Netherlands
- Russian Federation
- Slovak Republic
- Spain
- Sweden
- Switzerland
- Ukraine
- United States of America
- European Commission

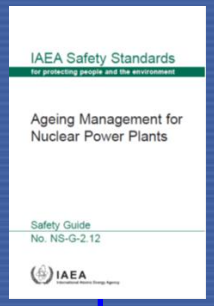
- Finland invited as observer
- Korea provided data

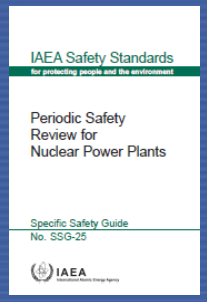
IAEA

Safety Standards on Ageing Management and LTO

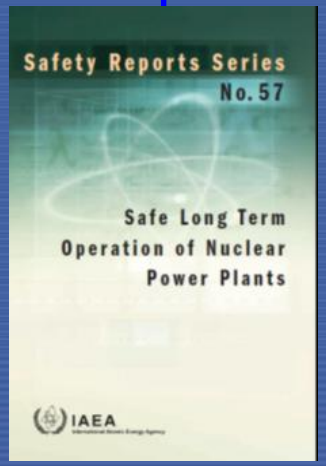
SSR-2/2: Commissioning and Operation

NS-G-2.12 Safety Guide on Ageing Management

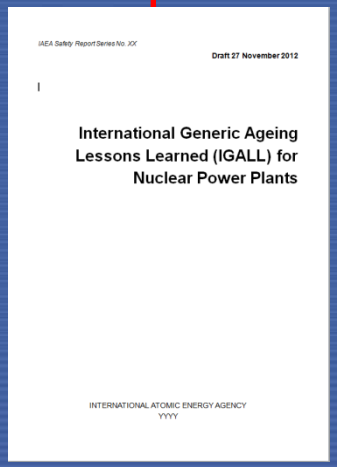




SSG-25 Safety Guide on PSR



SRS No 57 Safe LTO



SRS DD1085 IGALL Report

SS No 17 SALTO Guidelines

IAEA

IGALL Safety Report

- IGALL Final Report will be published as an IAEA SAFETY REPORT in 2013

- IGALL database on IAEA web sites contains:

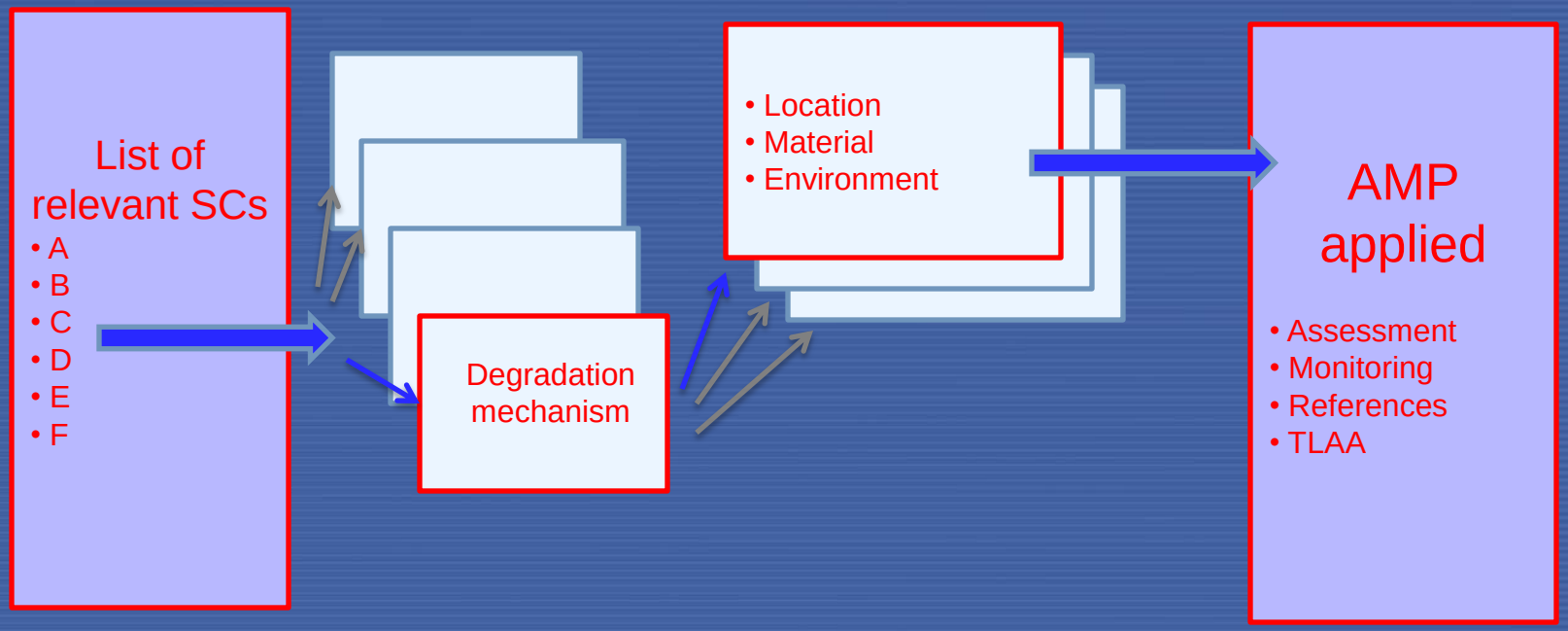
  - 76 Ageing Management Programmes (AMPs)
  - 27 Time Limited Ageing Analysis (TLAAs)
  - More than 2400 consolidated line items in AMR tables (totally more 7000 line items collected from MS)

- Link to IGALL public database:

  http://gnssn.iaea.org/NSNI/PoS/IGALL/SitePages/Home.aspx

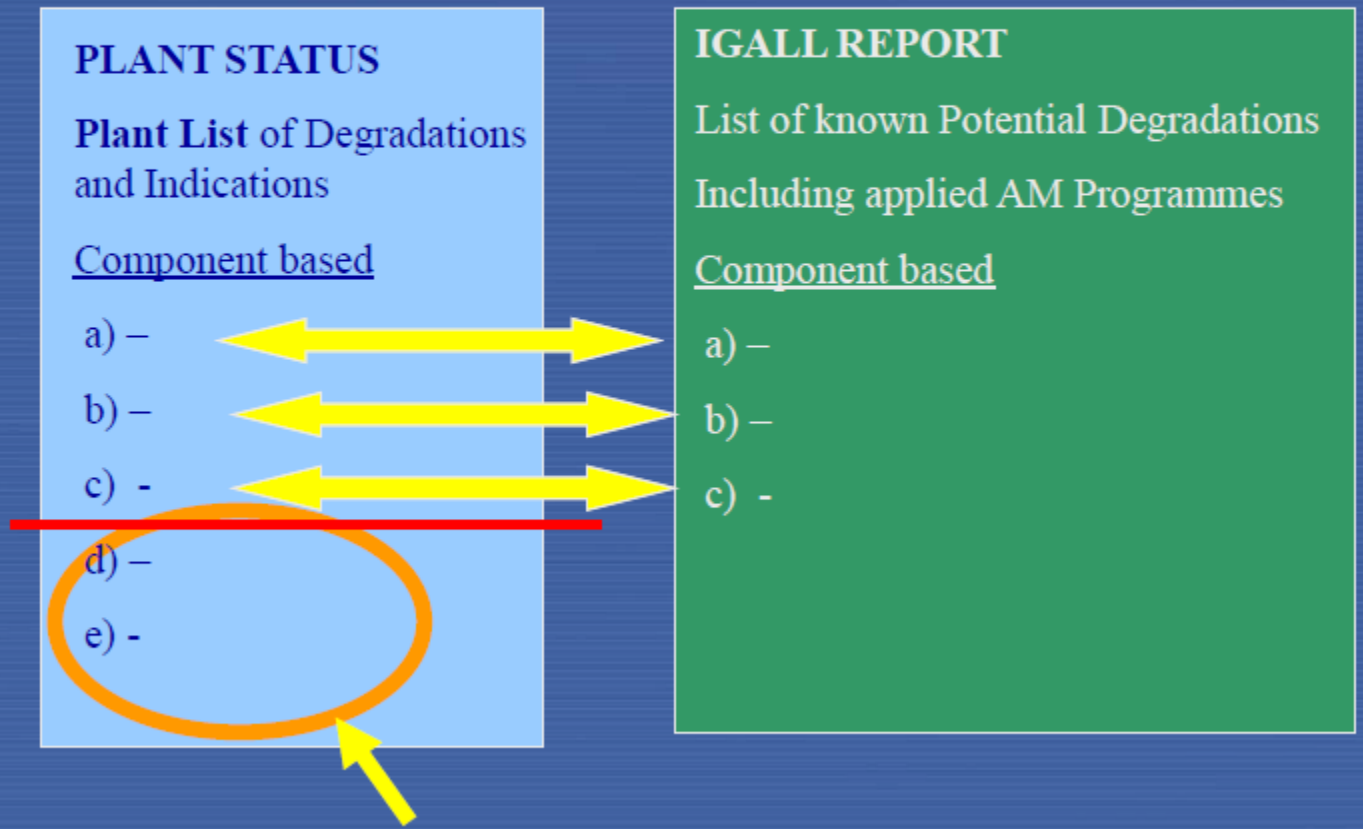
IAEA

International GALL - Logical schema



IAEA

International GALL – Use for assessment of LTO



IAEA

Comparison of IGALL with GALL, Rev. 2

1) General differences

- Passive but also active safety related SSCs
- Covering all water moderated reactor designs – PWR (incl. WWER), BWR, CANDU, PHWR
- Collection of all „proven“ AMPs
- Description of typical TLAAs
- AMR tables – more than one AMP or TLAA may occur as a recommended solution based on different MS approaches
- AMP – nine IAEA attributes used to describe AMP

IAEA

Comparison of IGALL with GALL, Rev. 2

2) AMPs

- IGALL – 76 AMPs x 50 GALL AMPs
- Additional IGALL AMPs :
  - Fatigue Monitoring
  - Reactor Coolant Pump
  - Containment Bellows
  - Environmental Qualification
  - Active and passive electrical and I&C commodity groups
  - Non-metallic Liner
  - Ground Movement Surveillance
  - Containment Monitoring System
  - Concrete Expansion Detection and Monitoring System
  - Containment Pre-stressing System
  - CANDU/PHWR mechanical AMPs (8)

IAEA

Comparison of IGALL with GALL, Rev. 2

3) TLAAs

- Description of typical TLAAs:
  - Mechanical components – 22 TLAAs
  - Electrical and I&C components – 1 TLAA
  - Civil structures – 4 TLAAs

IAEA

IGALL Phase 2 – 2014 - 2015

IGALL Objectives and activities in 2014-2015:

1) Provide forum for exchange of experience and support to MS in applying IGALL as a tool to address AM and safe LTO:

   a. Organize workshops, expert missions to explain to regulators and utilities how to apply IGALL

   b. Assist MS to implement IGALL in pilot plants (BWR, CANDU/PHWR, PWR, WWER) – workshops of IAEA, regulators and industry

   c. Extend this experience to other MS with the same technology

IAEA

IGALL Phase 2 Objectives and Activities

2) Enhance the completeness of IGALL:

a. CANDU mechanical components (CAN, ARG, PAK, IND, ROM)

b. WWER mechanical components (UKR, SVK, CZE, HUN, FIN, BUL, EU, RUS, ARM)

c. Active I&C and electrical components (SPA, SWE, BRA, JPN, ARG, GER, HUN, FRA, BEL, CHI, NED, RUS)

d. Management of technological obsolescence (SPA, JPN, MEX, BRA, ARG, CZE, PAK, SVK, FRA, IND, BEL, ROM, SWE, SWI, NED, RUS, ARM)

IAEA

Thank you for your attention!

IAEA