

# PEER REVIEWS ON THE SAFETY ASPECTS OF LONG TERM OPERATION (SALTO)

Nuclear Safety and Security Programme



60 Years

IAEA *Atoms for Peace and Development*

## Foreword



More than half of the world's operational nuclear power plants are over 30 years old. Many Member States are considering operating these plants beyond their originally envisaged lifetimes, often for economic and environmental reasons. This

brings an increased interest in — and need for — plant life management strategies and preparations to ensure that long term operation (LTO) remains safe.

The International Atomic Energy Agency (IAEA) supports Member States in LTO preparation through the publication of related safety standards and providing safety review services to assist in the application of these standards. The safety review service known as SALTO — Safety Aspects of Long Term Operation — comprehensively addresses strategies and technical elements necessary to manage the safety of a NPP during long term operation.

SALTO missions help countries that operate NPPs to ensure that all aspects necessary to manage LTO are in place. But the benefits of each mission go far beyond the host country's borders: good practices are identified and shared with all Member States operating nuclear power plants. In this way, every SALTO mission contributes to global nuclear safety.

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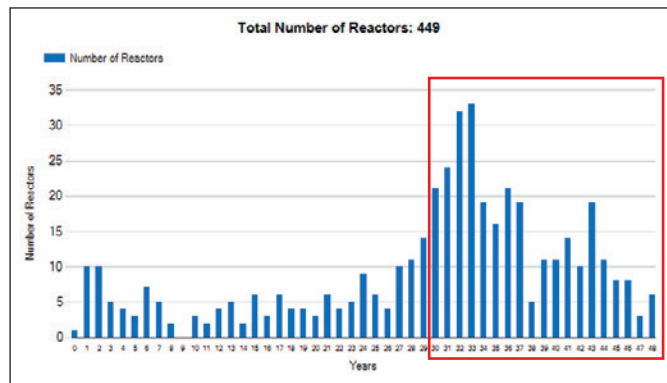
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# What is a SALTO peer review?

## Background

More than half of the world's operational nuclear power plants (NPPs) have been in operation for more than 30 years, and in many countries operation of these NPPs beyond the original lifetimes has been approved or is being planned.



(As of April 2017)

Long term operation (LTO) of a nuclear power plant is operation beyond an established time frame defined by the license terms, the original plant design, relevant standards or national regulations. A safety assessment of potential LTO is needed to justify continued operation from a safety perspective. This assessment may take place within a broader regulatory process, such as license renewal or a periodic safety review. It should give specific consideration to the management of ageing processes that can affect the systems, structures and components (SSCs) that affect safety. The aim is to ensure that SSCs retain their ability to perform their intended safety functions throughout the planned period of LTO.

The IAEA offers several resources related to LTO, including safety standards, guidelines, technical reports and the Safety Aspects of Long Term Operation (SALTO) review service. SALTOs help Member States assess their readiness for LTO.

The SALTO peer review service is available on request to all IAEA Member States operating nuclear power plants.

## History

The IAEA started to develop guidance on NPP ageing management in the 1990s. A number of reports on the subject were published, providing general guidance and more specific support for selected major nuclear power plant components and structures.

To support the increasing number of IAEA Member States that were deciding to pursue LTO, the IAEA conducted an Extra-budgetary Programme on Safety Aspects of Long Term Operation (SALTO) of Water Moderated Reactors between 2003 and 2006.

This led to the development of a peer review service, based on the approach of the Operational Safety Review Team (OSART) service. The methodology was verified during narrow-scope engineering review missions that included the objectives of an earlier IAEA review conducted by Ageing Management Assessment Teams. The approach was formalized in 2007 when the first full-scope SALTO peer review mission took place.

By the end of 2017, 32 SALTO peer review missions will have been conducted at 19 nuclear power plants in 15 Member States (including 8 pilot SALTO missions), and 9 follow-up SALTO missions will have been conducted to review the implementation of initial mission results.

SALTO peer reviews complement the OSART service, which includes a more general and less comprehensive LTO module.

Table 1 shows SALTO missions and OSART missions that included LTO modules held from 2005 to 2017.

Table 1 SALTO Missions from 2005 to 2017 (P – Pre-SALTO mission; S – SALTO mission; O – OSART mission including LTO module)

Member State	Type of mission	No. of missions	No. of follow-up visits	Year of mission
Argentina	P	1		2016
Armenia	P	2		2013, 2016
Belgium	P, S	4	1	2012, 2015, 2016, 2017
Brazil	P	1		2013
Bulgaria	P	1		2016
Canada	O	2	1	2015, 2016, 2017
China	P, S	2		2015, 2017
Czech Republic, The	P, S	2	2	2008, 2011, 2014, 2016
Finland	O	1		2017
France	O	1		2017
Hungary	P, S	7	1	2005-2008, 2011, 2013
Korea, Republic of	S	2	2	2007, 2010, 2012, 2014
Mexico	P	1	1	2015, 2017
Netherlands, The	P, S	2	1	2009, 2012, 2014
Pakistan	P	1		2007
Slovakia	O	1	1	2010, 2012
Slovenia	O	1		2017
South Africa	P	2		2011, 2015
Sweden	P	3	1	2014, 2016, 2017
Switzerland	O	1	1	2012, 2014
Ukraine, The	P	1		2007
USA	O	1		2017

## Objectives

SALTO peer reviews aim to provide the host organization with:

- An objective assessment of the status of the preparedness for LTO with respect to IAEA safety standards,
- Recommendations and suggestions for improvement in areas where performance falls short of the safety standards or international best practices and,
- An opportunity to discuss practices with experts who have experience with LTO.

SALTO peer reviews evaluate programmes and performance on the basis of IAEA safety standards and other IAEA publications (see ‘Relevant IAEA Publications’) and draw on the expertise of the international review team. The review is a technical exchange of experience and practices at the working level aimed at strengthening the programmes, procedures and practices implemented at the plant. It is neither a regulatory inspection nor an audit against national codes and standards.

Good practices identified during reviews are shared with all IAEA Member States and the review team members benefit from broadened experience and knowledge.



## Review areas

SALTO peer reviews address the following areas:

- A. Organization and functions, current licensing basis, configuration/modification management
- B. Scoping and screening and plant programmes relevant to LTO
- C. Ageing management review, review of ageing management programmes and revalidation of time limited ageing analyses for mechanical components
- D. Ageing management review, review of ageing management programmes and revalidation of time limited ageing analyses for electrical and instrumentation and control components
- E. Ageing management review, review of ageing management programmes and revalidation of time limited ageing analyses for civil structures
- F. Human resources, competence and knowledge management for LTO

## Review team composition

Each SALTO review team is led by IAEA staff members and includes international experts with experience from utilities, regulatory authorities or support organizations, and IAEA staff members. The team never includes nationals of the host country organization.

Team members are selected to ensure that a variety of national approaches to ageing management and safe LTO are represented (see Table 2). Reviewers are experts in specific areas and familiar with other national approaches and relevant areas.

Table 2 Origin of experts and observers in SALTO missions from 2008 to 2017

Member State	Experts	Observers
Argentina	3	9
Armenia	—	4
Belgium	10	2
Brazil	3	6
Bulgaria	1	4
Canada	8	—
China	—	1
Czech Republic	11	7
Finland	6	3
France	10	2
Germany	1	1
Hungary	8	1
India	4	—
Japan	6	3
Korea, Republic of	—	1
Mexico	1	2
Netherlands	8	—
Romania	—	1
Russian Federation	—	1
Slovakia	—	2
Slovenia	—	1
South Africa	—	4
Spain	5	—
Sweden	22	11
Switzerland	14	—
Ukraine	1	3
United Kingdom	2	—
United States of America	24	—
<b>TOTAL</b>	<b>148</b>	<b>73</b>

## Review methodology

Each SALTO peer review involves three review techniques.

### 1) Review of documents and databases

- Team members review documents of general interest submitted by the host as part of an Advance Information Package (AIP).
- Team members review specific information related to their review area.

### 2) Observations of performance, status and activities

- Team members observe and review procedures and practices at the plant, including nuclear and industrial safety practices, use of procedures, drawings and instructions, quality control measures, supervision of activities and management control.

### 3) Interviews and discussions with personnel

- Team members seek answers to questions arising during the documentation review and collect additional information.
- Team members seek in-depth clarification on sample programmes and activities.
- Team members ensure they understand the work processes, duties and responsibilities.



## Sharing knowledge

The SALTO peer review programme promotes transparency and accountability. The SALTO Peer Review Guidelines are public, as are the IAEA safety standards that underpin the review.

The IAEA provides a review report to the requesting Member States and the NPP. The reports become available to the public 90 days after their official delivery to the host country, unless the country requests otherwise.

The IAEA issues press releases on some SALTO missions and publishes the reports' executive summaries on its website. Many hosts post SALTO mission reports online.


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## IAEA Concludes Safety Review at Qinshan Nuclear Power Plant in China

2017/22

Haiyan China

JUN  
15  
2017



Flag of China. (Photo: Will Clayton/Flickr)

### Related Resources

- [SALTO Missions on the IAEA website](#)
- [OSART Missions](#)

An International Atomic Energy Agency (IAEA) team of nuclear safety experts today completed an assessment of long-term operational safety at the Qinshan Nuclear Power Plant (NPP) Unit 1 in China.

The Safety Aspects of Long Term Operation (SALTO) review mission was requested by Nuclear Power Operations Management Co., part of China National Nuclear Power Co. (CNNP). The 12-member team, which began its in-depth review on 6 June, focused on aspects essential to the safe Long-Term Operation (LTO) of Unit 1, which was put in commercial operation in 1991.

The design life of the plant's Unit 1 is 30 years. China's National Nuclear

## How is a SALTO peer review carried out?

### SALTO peer review steps

An optional *workshop/seminar* on IAEA safety standards and SALTO methodology (3-4 days)

Phase 1: NPP in preparation for LTO

Step 1: Preparatory meeting for the mission (2 days)

Step 2: Pre-SALTO mission (8 days)  
(one or more Pre-SALTO missions can be conducted, 10-2 years before entering LTO)

Phase 2: NPP ready for LTO

Step 3: Preparatory meeting for the mission (2 days)

Step 4: SALTO mission (9 days)  
(less than 2 years before entering LTO)

Step 5: Follow-up mission (4 days)  
(typically 18 - 24 months after the mission)

## Pre-SALTO mission

A Pre-SALTO mission reviews existing plant programmes and LTO plans at an early stage, well in advance of entering LTO. This mission covers the completeness of the plant's intended activities for preparation for safe LTO and the compliance of those activities with the IAEA safety standards and guidance. A Pre-SALTO mission is typically followed by a SALTO mission but the plant may ask for multiple Pre-SALTO missions before the SALTO mission.



## Preparation for a Pre-SALTO mission

### *Preparatory meeting*

The IAEA staff member assigned as team leader visits the host organization about six months before the Pre-SALTO mission to meet plant management, counterparts and other organizations involved. The meeting addresses:

- The main features of the mission,
- The scope of the review, reflecting the requests of the host organization,
- Activities required of the plant including preparation of the advance information package,
- Logistic support required,
- Financial arrangements.

### *Plant counterparts and host plant peer (HPP)*

Plant management designates a counterpart for each review area and a host plant peer who will liaise between the host organization and the IAEA team, and participate in mission team meetings to advise the team. The HPP should be knowledgeable of the plant's overall management structure and systems

and have sufficient authority to ensure the success of the mission. The HPP should not have any plant duties for the duration of the mission.

### *Advance information package (AIP)*

The host organization prepares an advance information package (AIP) in English to convey relevant information to the mission members to help them prepare. The SALTO Peer Review Guidelines suggests a table of content for the AIP, which should be delivered to the IAEA at least 30 days before the team's arrival.

## Carrying out the Pre-SALTO mission

At the beginning of the Pre-SALTO mission, IAEA staff train the team members on review and evaluation skills and team work. Briefings also highlight factors unique to the mission and the nuclear power plant, plant access formalities, security, radiation protection, fire protection, emergency preparedness and industrial safety requirements. The team then meets senior plant management at an entrance meeting before they join their plant counterparts and the designated plant experts in the areas being reviewed.

Table 3 shows a typical Pre-SALTO mission schedule. Topic reviews often start with a brief presentation outlining the power plant's programmes and performance, followed by discussion, document review and field observations.

Team members conduct detailed discussions with plant counterparts to verify that they understand the plant's performance and opportunities for improvement or good practices.

Team members meet daily to share and findings to develop a team consensus on emerging issues. These discussions enable all team members to be fully informed of the review progress and to benefit from their peers' observations.





Table 3 Overview of Pre-SALTO mission's schedule on site

	Sat.	Sun.	Mon.	Tue.	Wed.	Thu.	Fri.
<b>Week 1</b>			<ul style="list-style-type: none"> <li>• Arrival</li> <li>• IAEA team briefing</li> </ul>	<ul style="list-style-type: none"> <li>• Entrance procedure in NPP</li> <li>• IAEA team training</li> <li>• Entrance meeting</li> <li>• Review</li> </ul>	<ul style="list-style-type: none"> <li>• Review</li> <li>• Team meeting with host peer</li> <li>• Team training</li> </ul>		
<b>Week 2</b>	(day off)	<ul style="list-style-type: none"> <li>• Team meeting</li> <li>• Team training</li> <li>• Drafting of working notes, issues, good practices and evaluative section of report</li> </ul>	<ul style="list-style-type: none"> <li>• Review</li> <li>• Finalizing of draft issues, preparation of evaluative part of report</li> <li>• Team meeting</li> </ul>	<ul style="list-style-type: none"> <li>• Team meeting</li> <li>• Discussion with counterparts</li> </ul>	<ul style="list-style-type: none"> <li>• Exit meeting preparation.</li> <li>• Exit meeting</li> <li>• Departure</li> </ul>		

Opportunities for improvement and potential good practices are discussed as they emerge. The team develops recommendations, suggestions and good practices by consensus. All are significant to improving safety performance, based on facts and refer to relevant IAEA safety standards.

#### *Recommendation*

Recommendations highlight how safety aspects of LTO should be improved. They are based on IAEA safety standards, IAEA Safety Reports or good international practices. Recommendations address the root causes rather than the symptoms of the identified concern. They are specific, realistic and, if implemented, will result in tangible improvements.

#### *Suggestion*

Suggestions are primarily intended to improve performance by indicating useful enhancements to existing programmes, and they may indirectly contribute to improvements in safety aspects of LTO.

The term encouragement is used to highlight relevant matters that do not meet the criteria for suggestions.

#### *Good practice*

Good practices are outstanding and proven performances, programmes, activities or equipment that contribute to safe LTO and sustained high performance. Good practices are better than practices observed elsewhere. They have applications broad enough to warrant sharing them with other nuclear power plant operators for consideration. A good practice is novel, has proven benefits and can be applied at other plants.

The term good performance is used to describe noteworthy performance that does not meet the good-practice criteria.

## Concluding the mission

The last days of the mission are reserved for reaching agreement on any open topics, completing the draft mission report and discussing it in its entirety with the plant counterparts.



## Reporting the results of the Pre-SALTO mission

Team members' observations and conclusions are shared with the host plant and discussed in detail with the plant counterparts. Team members also present their findings to the plant management. The draft mission report forms the basis of an official report prepared by the team leader and deputy team leader after each mission. This report summarizes the team's observations and conclusions, and includes references to all recommendations, suggestions and good practices identified by the team.

Before the official report is finalized, the host plant and regulatory authority are offered an opportunity to provide comments. The approved official report is then submitted through official channels to the Member State that requested the mission. Initially, the IAEA shares the report only with the utility and regulatory authority involved, but Member States can distribute the report as they see fit. The reports become available to the public 90 days after their official delivery to the host country, unless the country requests otherwise.

The IAEA posts executive summaries of the reports on its website.



## SALTO mission

The SALTO mission reviews the status of the LTO activities close to their completion or when completed, and prior to entering the LTO period.

SALTO missions are conducted in a manner similar to Pre-SALTO missions, but they are one day longer.

## Follow-up mission

Follow-up missions review progress in implementing recommendations and suggestions to resolve issues. Follow-up mission teams comprise the team leader and one to three other members of the original review team.

The follow-up mission report augments the findings of the original mission.

## SALTO peer review results database

The IAEA intends to establish a 'SALTO peer review results database'. This searchable database will contain information on specific SALTO review areas and topics. The database aims to help organizations and individuals in the nuclear industry strengthen nuclear safety performance. The database will be regularly updated with the results of SALTO peer reviews.

In addition, the IAEA web site contains information and other relevant materials.

<https://www.iaea.org/services/review-missions/safety-aspects-of-long-term-operation-salto>

## Future outlook

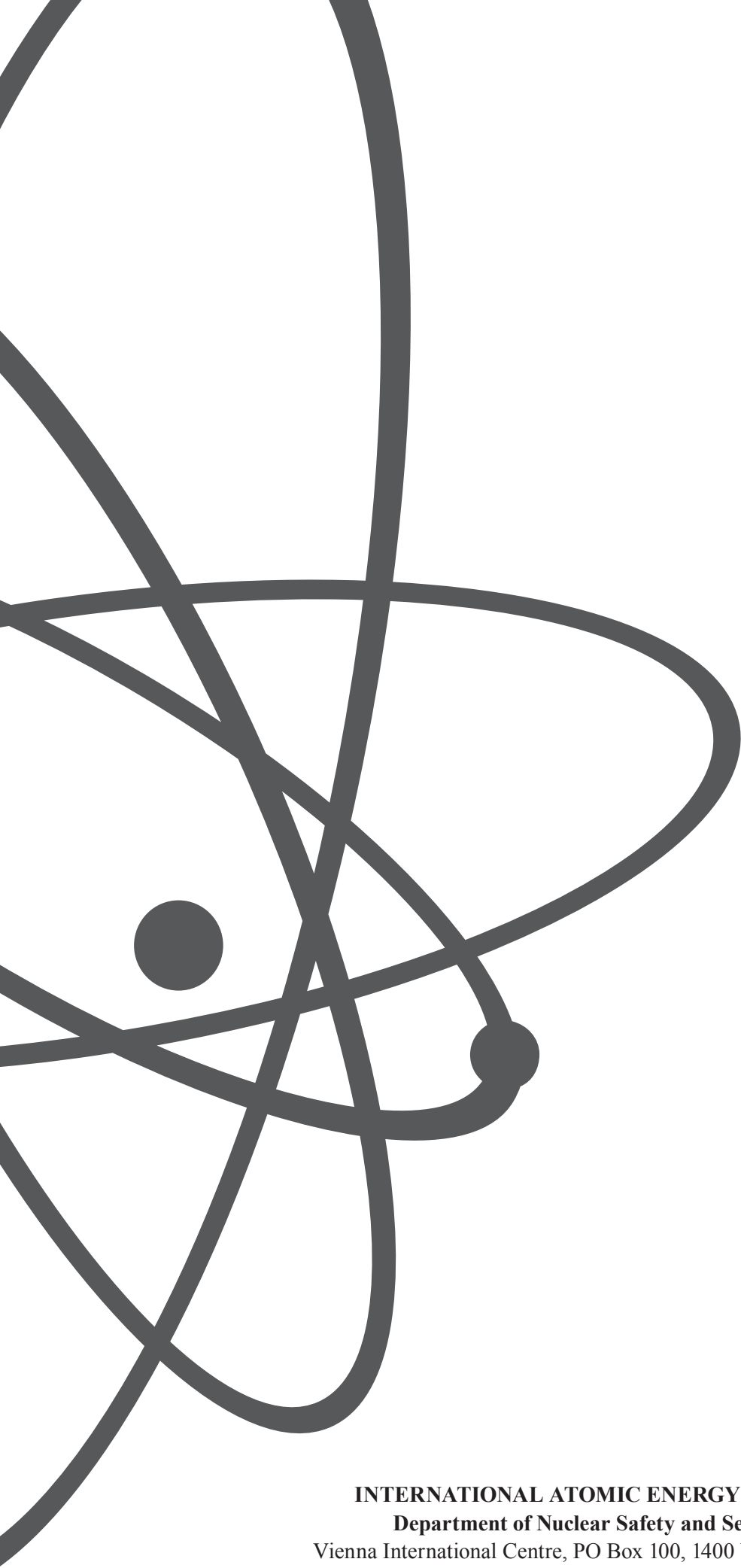
The IAEA frequently reviews the SALTO peer review programme to enhance its usefulness and effectiveness, incorporate new features and eliminate outdated ones. At the end of each mission, the SALTO mission members complete a questionnaire on the SALTO peer review process and provide improvement proposals. Feedback is also collected from hosts.

Regular IAEA technical meetings with industry experts also provide suggestions and feedback. The documents related to the SALTO peer review service are revised to reflect this feedback and industry-wide progress in nuclear safety.

The feedback from the SALTO programme has been used to update the IAEA safety standards.

## Relevant IAEA publications

Series/number	Title
<b>Safety Standards</b>	
SSR-2/1 (Rev.1)	Safety of Nuclear Power Plants: Design
SSR-2/2 (Rev.1)	Safety of Nuclear Power Plants: Commissioning and Operation
GSR Part 2	Leadership and Management for Safety
GS-G-3.1	Application of the Management System for Facilities and Activities
GS-G-3.5	The Management System for Nuclear Installations
NS-G-2.1	Fire Safety in the Operation of Nuclear Power Plants
NS-G-2.3	Modifications to Nuclear Power Plants
NS-G-2.4	The Operating Organization for Nuclear Power Plants
NS-G-2.6	Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants
NS-G-2.8	Recruitment, Qualification and Training of Personnel for Nuclear Power Plants
NS-G-2.11	A System for the Feedback of Experience from Events in Nuclear Installations
NS-G-2.14	Conduct of Operations at Nuclear Power Plants
NS-G-3.2	Dispersion of Radioactive Material in Air and Water and Consideration of Population Distribution in Site Evaluation for Nuclear Power Plants
SSG-13	Chemistry Programme for Water Cooled Nuclear Power Plants
SSG-25	Periodic Safety Review of Nuclear Power Plants
SSG-48	Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants
<b>INSAG Series</b>	
No.19	Maintaining the Design Integrity of Nuclear Installations throughout Their Operating Life
<b>Safety Reports Series</b>	
No.3	Equipment Qualification in Operational Nuclear Power Plants: Upgrading, Preserving and Reviewing
No.57	Safe Long Term Operation of Nuclear Power Plants
No.65	Application of Configuration Management in Nuclear Power Plants
No.82	Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)
<b>Services Series</b>	
No.12 (Rev.1)	OSART Guidelines
No.26	SALTO Peer Review Guidelines



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