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International Atomic Energy Agency

OSART Guidelines

2022 Edition

Guidelines for Peer Review by Operational Safety Review Teams (OSARTs) for Nuclear Power Plants and Closely Related Organizations (Excluding for the Corporate Functions of Organizations)

Vienna, November 2022

IAEA Services Series 12 (Rev. 2)

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IAEA SERVICES SERIES No. 12 (Rev. 2)

OSART GUIDELINES

2022 EDITION

GUIDELINES FOR PEER REVIEW BY OPERATIONAL SAFETY REVIEW TEAMS (OSARTS)
FOR NUCLEAR POWER PLANTS AND CLOSELY RELATED ORGANIZATIONS
(EXCLUDING FOR THE CORPORATE FUNCTIONS OF ORGANIZATIONS)

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2022

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FOREWORD

The IAEA Operational Safety Review Team (OSART) programme provides advice and assistance to IAEA Member States to enhance the safety of nuclear power plants and closely related organizations (e.g. large maintenance contractors, commissioning organizations) during construction, commissioning, operation and the transition from operations to decommissioning. The OSART programme, initiated in 1982, is available to all Member States with nuclear power plants under commissioning or in operation.

Between 2016 and 2021, the existing OSART guidelines were mainly used by operating organizations of nuclear power plants and experts of the international review team to prepare for OSART missions.

As the OSART programme evolves to keep pace with developments in the nuclear industry and the IAEA, the existing OSART guidelines need to be updated to align with recently revised IAEA safety standards on operational safety.

The revised OSART guidelines provide overall information on how to conduct OSART missions for both the international review team and their counterparts in Member States to ensure the consistency and comprehensiveness of the peer review service. This publication updates IAEA Services Series No. 12 (Rev. 1), OSART Guidelines, 2015 Edition, Reference Report for IAEA Operational Safety Review Teams (OSARTs).

The IAEA officers responsible for this publication were Y. Martynenko and K. Nagashima of the Division of Nuclear Installation Safety.

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1. INTRODUCTION

1.1. BACKGROUND

The Operational Safety Review Team (OSART) programme is one of the IAEA's safety review services. Established in 1982, the OSART programme has provided advice and assistance to Member States for 40 years, to enhance the operational safety of nuclear power plants during construction, commissioning, operation and transition from operation to decommissioning. It has also been greatly valued for providing an opportunity for operating organizations in all countries to assist other operating organizations through the dissemination of information on best practices and lessons learned.

The main purpose of the IAEA's OSART programme is to assist Member States in strengthening the operational safety of their nuclear power plants and closely related organizations by comparing actual practices with the IAEA safety standards. For the purpose of this publication, the term 'closely related organizations' means organizations that provide supporting roles covering major operational functions (e.g. maintenance, commissioning, transition to decommissioning) or roles that may affect nuclear safety (e.g. engineering support for plant modifications, optimization of fuel performance, power uprates).

Each OSART mission is conducted by a team of experts from all regions of the world. Each of these experts has acquired extensive knowledge and experience in operating organizations or technical support organizations. The OSART programme is an important tool for ensuring better conformance and alignment with the IAEA safety standards, related to operational safety of nuclear installations. The guidelines used to review performance and programmes are based on these standards.

This revision of the OSART Guidelines supersedes the 2015 Edition, issued as IAEA Services Series No. 12 (Rev.1). It is based on the experience of using the 2015 Edition and includes the following:

- Inclusion of any changes arising from the introduction or revision of interface publications, such as eight IAEA Safety Guides frequently used by the OSART team, and other publications revised since 2016;
- Optimization of the OSART mission process to ensure it incorporates the current best practices;
- Inclusion of the changes from the project enhancing the pre-operational OSART mission and the experience gained during recent pre-operational OSART missions;
- Inclusion of an enhanced follow-up process in case of numerous cases of 'insufficient progress' in addressing OSART issues;
- A process to conduct a follow-up visit in two stages considering the plant specific circumstances that may arise during post mission self-assessment and development of the corrective action plan during the preparations for the follow-up mission;
- The option for a two-staged preparatory meeting, and a follow-up visit combining virtual and on-site visits, some of which have been used during the pandemic situation;
- Arrangements for using the OSART methodology to assess activities at closely related organizations that provide supporting roles covering major operational functions (e.g. maintenance, commissioning) or roles that may affect nuclear safety (e.g. engineering support for plant modifications, optimization of fuel performance, power uprates).

1.2. OBJECTIVE

The revised OSART guidelines are primarily intended for members of an IAEA OSART peer review team. They provide a basic structure and common terms of reference, across the various areas of review covered by an OSART mission and across all the missions in the programme. As such, they provide guidance on how to prepare for and conduct an OSART mission to:

- The team members of the OSART mission;
- The host organization receiving the OSART mission;
- The host country that has invited the OSART mission.

The reference documentation, provided in Section 6 of this publication, will also prove valuable reading for staff at the host organization and closely related organizations to be reviewed as appropriate.

1.3. SCOPE

These guidelines cover the following elements:

- Overview and objectives of the OSART peer review service;
- The OSART mission process;
- The review methodology of the OSART mission;
- Practical tips for the OSART reviewers;
- Specific guidelines for each review area in the OSART mission.

These guidelines do not address a specific peer review service of corporate functions of organizations that operate nuclear power plants – the Corporate OSART. This review service is dealt with in the Corporate OSART Guidelines [1].

1.4. STRUCTURE

This Services Series publication is structured into six Sections and three Annexes. Section 1 provides the background of the IAEA's OSART programme, and describes the objectives, scope and structure of the OSART guidelines. Section 2 provides an overview, objectives and benefits of the OSART peer review service. Section 3 provides a description of the review process of the OSART mission. Section 4 provides the review methodology of the OSART mission. Section 5 provides practical tips for reviewers in the frame of the OSART mission. Section 6 provides detailed information about each review area, the relevant IAEA safety standards, and expectations. Annexes I to III provide additional information for the OSART mission preparations, conduct and reporting.

2. OSART PEER REVIEW SERVICE

2.1. OVERVIEW OF THE OSART SERVICE

The peer review of the OSART mission is mainly focused on the fulfilment of safety requirements established in the IAEA Safety Standards Series No. SSR-2/2 (Rev.1), Safety of Nuclear Power Plants: Commissioning and Operation [2], and the associated recommendations provided in the IAEA Safety Standards Series. A complete list of IAEA basis publications for nuclear power plants is provided in Section 6.

The OSART review includes, but is not limited to: direct observations of material conditions, housekeeping, operating practices, employee behaviours and employees' conduct of work in the field; interviews and discussions with personnel; the records and reports of the operating history; and the documents that describe its written policies, programmes and procedures. The review focuses on performance in various areas important to safety, managerial aspects of policy and programmes implementation, control of activities, verification and correction, as well as document control.

An OSART review can also take place at a nuclear power plant project at the main commissioning phases when many organizational and technical decisions are being taken that will affect operational safety performance of the nuclear power plant or closely related organization – this is known as a pre-operational OSART. Pre-operational OSARTs usually take place within six months of the expected first milestone for nuclear fuel loading.

In addition, an OSART review can take place at a nuclear power plant or closely related organization which is going to transition from operation to decommissioning. The transitional period starts when the public announcement of the final shutdown date is made, and continues until all nuclear fuel has been permanently removed from both the reactor core and spent fuel storage pool. As the duration of this period is dependent on the circumstances surrounding each operating organization, the timing of the OSART including the review of the transitional period from operation to decommissioning is therefore determined in consultation with the host organization, but as a guide, it takes place three to five years before the final shutdown, to allow time for follow-up of the results of the mission.

Specific review guidelines are presented in Sections 6.1 to 6.14, covering the following OSART review areas:

1) Leadership and management for safety (LMS);
2) Training and qualification (TQ);
3) Operations (OPS);
4) Maintenance (MA);
5) Technical support (TS);
6) Operating experience feedback (OEF);
7) Radiation protection (RP);
8) Chemistry (CH);
9) Emergency preparedness and response (EPR);
10) Accident management (AM);
11) Long term operation (LTO);
12) Commissioning (COM);
13) Transitional period from operation to decommissioning (TRAD);
14) Use of probabilistic safety assessment for plant operational safety improvements (PSA).

The scope of the OSART review will depend on the status of the nuclear installation project. Areas 1 to 10 are for the main programmes within operational safety and interact closely with each other; therefore, all 10 areas necessitate a comprehensive assessment of the host organization's operational safety. Areas 1 to 10 and 14, as well as area 11 for installations planning to extend their operating lifetime and area 13 for installations with a scheduled final shutdown date in the near term, will be reviewed at an operational installation. If an OSART mission is conducted at the time of commissioning of a nuclear power plant or closely related organization, the review scope will include area 12 (commissioning) in addition to the areas 1 to 10. The OSART methodology can be adapted to suit the features of the installation and the particular needs of Member States.

The scope of the OSART review is defined and agreed during the preparatory meeting, which is normally conducted around 12–18 months before the mission.

The specific guidelines in Section 6 for each review area are intended to help each expert in preparing for the review and are based on the requirements within the relevant IAEA safety standards. These guidelines are not all-inclusive and should not limit the expert's reviews but are better considered as illustrating the comprehensive requirements for the review. Therefore, it is expected that — based on the advance information package, including the results of the host organization's self-assessment against the IAEA safety standards, where applicable, and the results of the initial part of the review — the experts apply judgments to decide which topics need more in-depth evaluation.

The OSART mission is a peer review conducted by a team of international experts with direct experience applicable to the areas of evaluation. The review mission is neither a regulatory inspection, nor an audit against national regulatory requirements. Instead, it is a review based on technical exchange of experiences and practices, aimed at identifying opportunities for strengthening policies, programmes, procedures, behaviours, and practices utilizing the IAEA safety standards as the basis for the review.

2.2. OSART SERVICE OBJECTIVES AND BENEFITS

The key objectives of an OSART mission are to provide:

- The host organization with an opportunity to review its conformance and alignment with the IAEA safety standards and identify possible self-identified issues by conducting a self-assessment during the preparation phase prior to the mission;
- The host country (regulatory body, operating organization, holder of the operating licence and governmental authorities) with an objective and independent assessment of the status of operational safety with respect to the IAEA safety standards;
- The host organization with an opportunity to improve their performance based on recommendations and suggestions and to enhance operational safety of their nuclear power plant(s) and closely related organizations.

Additional benefits of the peer review service are to provide:

- The host organization with support for their continuous improvement of the operational safety (through capacity building) for self-identification, self-analysis, and self-resolution of issues having an impact on operational safety;
- Key staff of the host organization, OSART team members and observers with an opportunity to conduct informal exchanges of operating experience and to broaden their knowledge in their own field and on the IAEA safety standards;
- All IAEA Member States with information regarding good practices identified in the course of OSART reviews, thus facilitating their application;
- IAEA staff with an opportunity to identify areas where the IAEA safety standards could be further strengthened.

3. OSART MISSION PROCESS

A standard OSART process follows the steps and the time frame identified in Fig. 1.

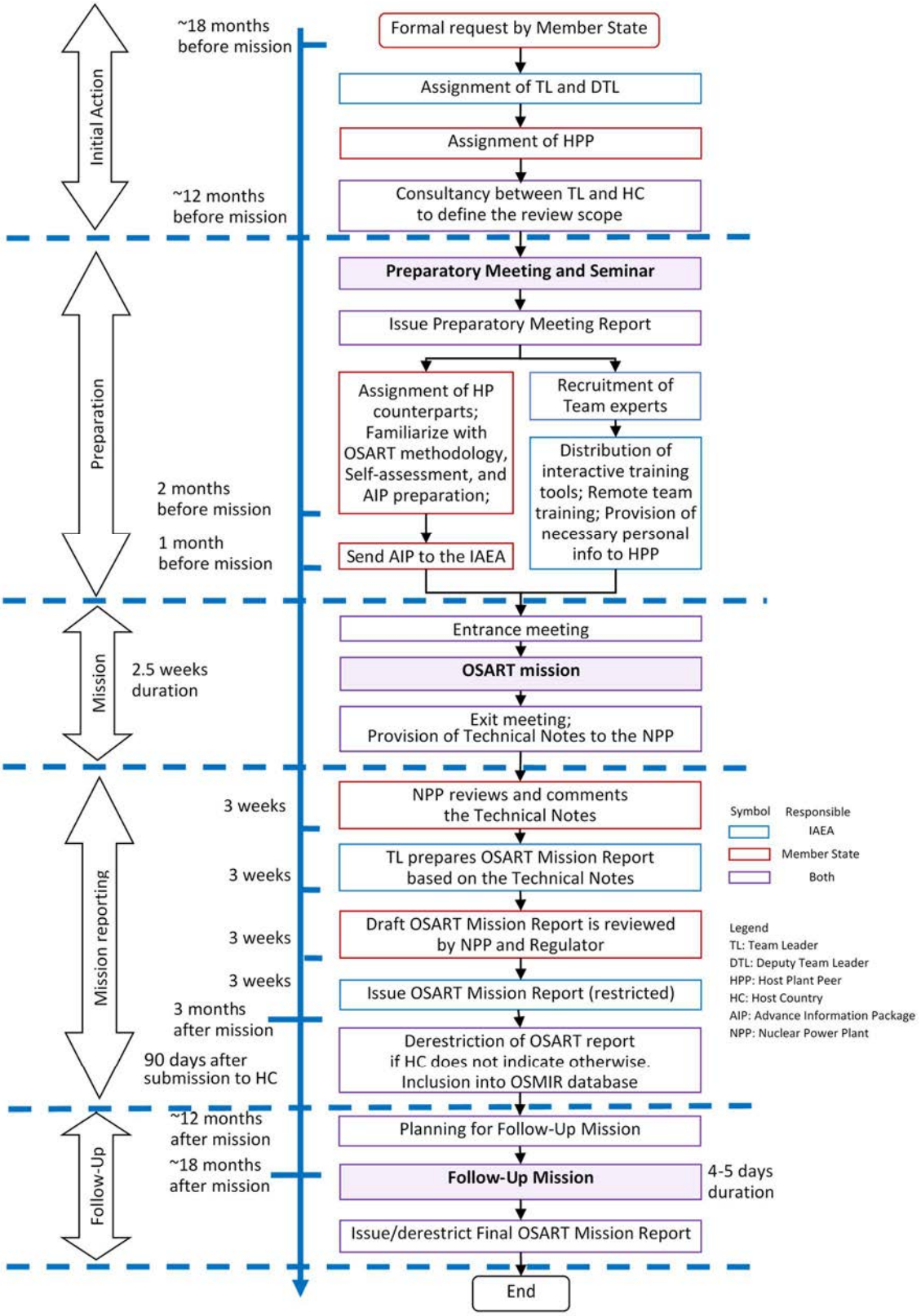

FIG. 1. A standard OSART process

3.1. INITIATING AN OSART MISSION

This Section provides initial actions of an OSART mission.

3.1.1. Member State request for an OSART mission

An OSART mission is requested by an operating organization of nuclear power plant(s) or closely related organization via its national nuclear safety regulatory body or other relevant governmental body. A request for an OSART mission should be transmitted to the IAEA Deputy Director General, Head of the Nuclear Safety and Security Department, 18–24 months before its proposed date.

The following information should be included in the request for an OSART mission:

- The name of plant or host organization;
- The proposed period of the OSART mission;
- The proposed scope of the OSART mission, if already available;
- A point of contact (name, position, telephone, e-mail address).

3.1.2. IAEA initial response

On receipt of a request for an OSART mission, an IAEA team leader and deputy team leader will be assigned to establish liaison contacts with the host operating organization and regulatory body and arrange a preparatory meeting with the senior management of the host organization and other organizations involved. The IAEA will coordinate with other international peer review services to avoid scheduling conflict for the OSART mission.

3.1.3. Host plant peer assignment

When requesting an OSART mission, the host organization of the nuclear power plant or closely related organization should designate a host plant peer with the following roles and responsibilities:

- The host plant peer is a staff member with good overall knowledge of the host organization, its strategies, policies, programmes, procedures and staff, and good English language skills are preferred.
- The host plant peer’s main role is to act as liaison officer between the host organization team and the IAEA team leadership. During the mission, the host plant peer is expected to be dedicated to the OSART mission.
- The host plant peer participates in the OSART team meetings, and advises the OSART team members when information may not be completed or correct.
- In case of misunderstandings or issues needing further clarification, the host plant peer points the OSART team towards the responsible or knowledgeable staff in specific areas who could provide clarification and clear any misunderstandings.

3.1.4. Consultancy on the scope

The scope of the OSART mission is defined via consultation between the team leader and nuclear power plant or host organization representatives or the host plant peer. The review areas can be tailored to the needs of the host organization and finally agreed during the preparatory meeting.

3.2. OSART MISSION PREPARATION

This Section provides preparation of an OSART mission.

3.2.1. Preparatory meeting and seminar

The purpose of the three-day OSART mission preparatory meeting is to familiarize the host organization's staff with the OSART methodology and to discuss the necessary arrangements which have to be implemented prior to the mission. The preparatory meeting, usually attended by the IAEA team leader and the deputy team leader, is held at the plant site (approximately 12–18 months prior to the mission) to ensure that the senior management and counterparts of the host organization, and other organizations involved can all participate[1]. As part of preparation for the seminar, the staff of the host organization familiarize themselves with the OSART guidelines and the IAEA safety standards related to activities of the host organization that affect operational safety of the nuclear power plant(s) which form the basis of OSART review.

During the preparatory meeting, the following subjects are covered:

- The main features of the OSART methodology;
- The scope of the review, reflecting the request of the host organization;
- Working notes outlines (WNO);
- Preparations for the review by host organization;
- The self-assessment by host organization;
- Preparation of the advance information package (AIP);
- Logistical support required;
- Financial arrangements for the OSART mission and its follow-up mission.

A significant portion of the preparatory meeting is dedicated to a detailed presentation of the OSART methodology to staff of the host organization. In addition, the staff are trained to apply OSART 'field review' and 'issue development' techniques through practical exercises within the host organization. The preparatory meeting is designed to help the host organization conduct its self-assessment and prepare for the OSART mission. The host organization will be offered the opportunity to send (an) observer(s)/reviewer(s) on (an)other OSART(s) before the mission, to gain practical experience on the way an OSART mission is conducted.

3.2.2. Report of the preparatory meeting

Upon the return from the preparatory meeting, the team leader prepares a report of the preparatory meeting, copies of which will be sent for review and comment to the host plant peer.

3.2.3. Recruitment of team experts

Following the preparatory meeting (9–3 months before the OSART mission), the designated IAEA team leader starts assembling the mission team. The OSART team is composed of a team leader and

[1] In exceptional circumstances (e.g. pandemic), the preparatory meeting can be planned with two phases: Part 1: Virtual meeting with the team leader and the deputy team leader, plant management and plant counterparts for each review area. Presentations on OSART methodology and discussion on administrative and logistic support for the mission will be conducted. Part 2: Site visit to conduct field coaching of plant counterpart on OSART methodology and development of issues.

a deputy team leader (who are always IAEA staff), reviewers (according to the scope of the review), and up to three observers.

The reviewers are professionals from diverse backgrounds, and include experienced and new reviewers representing operating organizations and technical support organizations. They should have a minimum of ten years of work experience in the nuclear field, and a minimum of five years of experience of working in a supervisory or managerial position in the area of review.

The area of review 'Operations' is reviewed by two reviewers. The team will not include a member from the host country, or experts who may have conflicts of interest.

3.2.4. Preparations by the host organization

The senior management of the host organization should designate one counterpart for each area of review (two for the area of operations), to be the contact person for the corresponding team member during the review. The senior management of the host organization should ensure that the same counterpart can be fully dedicated throughout the review period and work cooperatively with reviewers to take responsibilities for issues found in their own area.

An important aspect of preparation for an OSART mission is the conduct of a thorough self-assessment of its operational safety performance using the WNOs that will be used during the mission. The results of the self-assessment should contain the following key components:

- For each review area, a description of how each individual expectation, as described in Section 6, is met, using the sub-heading in each of the WNO areas. This information is typically presented on 3 to 4 pages;
- Specific gaps where performance or programmes do not fully meet the IAEA safety standards;
- Where gaps are identified, an explanation of what corrective actions are being taken and/or planned to address the gap, including budget commitments, staffing, document preparation, increased or modified training, equipment purchases, etc.

The host organization may decide to declare a gap identified during its self-assessment of the operational safety performance compared to the IAEA safety standards as a self-identified issue. In doing so, the host organization presents an identified gap in a format of an issue, including all the required attributes of the issue, such as:

- Issue statement: fundamental overall problem (FOP);
- Supporting facts: programme and performance based as necessary supporting FOP, recent events in the nuclear power plant could also be included as supporting facts;
- Statement on the significance of the issue to the operational safety (the safety consequence);
- Statement of the necessary action to be taken to solve the identified issue, based on a causal analysis (contributing, apparent and root causes);
- References to the appropriate IAEA safety standards;
- Supported by an action plan towards resolution of the issue.

The host organization should categorize each issue as either a recommendation or a suggestion, depending on the significance of the problematic area to the operational safety (see section 4.4).

This suite of information associated with the self-identified issue(s) (including an action plan) will then be included into the relevant chapter of the AIP that the host organization needs to prepare and

send to the IAEA for distribution amongst the OSART team members at least one month prior to the mission.

If the host organization proposed the issue(s) prior to the OSART mission, the team will assess the issue(s) during review of the AIP. During the OSART mission, as part of the concerned area review, the team will build its opinion on the issue proposed by the host organization as well as on the associated action plan. The mutual agreement on the status of the issue has to be reached. When the team agrees that a proposed issue is valid and the host organization's effort in addressing the issue is reasonable, it will be categorized as a self-identified issue.

The results of the self-assessment may be included in the AIP in sufficient detail for the OSART team members to understand any challenges which the host organization might currently be faced. The AIP should also contain adequate information and data to ensure a good understanding of the overall host organization's vision of safety policies, safety goals and targets, organizational structures, current operating practices, the key operational features and safety performance indicators.

While the contents of the AIP should cover essential operational safety related information, it should also be concise. All descriptions in the AIP should be in English, as this is the OSART mission working language. A typical AIP content is given in ANNEX I.

3.2.5. IAEA preparatory activities

Three months to two weeks before the OSART mission, the team leader ensures timely distribution of WNOs and interactive training tools to the mission team members to provide for remote team training to familiarize themselves with or refresh OSART methodology and the publications used as the review basis (see IAEA basis in Section 6).

The team leader ensures that the host plant peer identifies and communicates to the IAEA and the OSART team members all the information that may be needed for team members to be granted plant access. This information and relevant paperwork which need to be completed, should be provided to team members in sufficient time to allow for their completion, prior to arrival on the site.

The team leader maintains contact with the host plant peer during this period to confirm that all arrangements are progressing as planned, i.e. (a) the host organization has made arrangements for a hotel, with a workspace and PC hardware, printer and projector needed for the OSART team members; (b) the AIP has been sent to the OSART team members; (c) the host organization has received all the information necessary to ensure that the OSART team members will have access to the host organization; (d) all logistical support needed for the mission is ensured; and (e) the team is made aware of initial arrangements regarding transport from the airport and any initial activities.

Basically, one day prior to the start of the OSART mission, the OSART team will complete the following final arrangements at the site and/or the hotel. During this day:

- The team leader and the deputy team leader conduct the IAEA OSART team training;
- The team members deliver reports and discuss comments on the AIP review including the potential strengths, weak points and a list of questions they may have;
- The training is given to the OSART team members by the host organization to grant their access to the plant;
- A whole body counting is completed for each member of the OSART team, according to the relevant procedures, if required;
- The team leader and the deputy team leader check that the Local Area Network (LAN) to be used by the OSART team is set up and that OSART common folders have been created, where the information needed to perform the OSART mission is uploaded.

3.3. OSART MISSION

This Section describes the process during an OSART mission.

3.3.1. Entrance meeting

On the first day of the mission, an entrance meeting is held in the morning. This meeting is attended by senior management or representatives of the host organization, the regulatory body and other concerned authorities, the OSART team members and their counterparts from the host organization.

3.3.2. The review

In the afternoon following the entrance meeting, a general plant condition observation (i.e. plant tour) is conducted in several groups, covering as many areas of the plant/installation as possible with the aim of having first impression of the plant/installation.

The team will conduct the OSART mission activities in accordance with the review schedule agreed with the host organization in advance. A typical OSART review schedule is presented in Table 1. In addition, each reviewer will prepare a review schedule for his or her own area and agree it with the respective counterpart.

TABLE 1. A TYPICAL OSART REVIEW SCHEDULE

	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	Travel	Travel	Entrance meeting and plant tour	Area review	Area review	Area review	Area review
Week 2	Team rest	Team discussion on potential issues	Area review	Area review	Area review	Area review	Area review
Week 3	Drafting issues for Technical Notes	Team rest	Complete drafting of Technical Notes	Whole team reviews draft Technical Notes	Finalize Technical Notes following discussion with counterpart	Exit meeting Travel home	Travel home

On the third day of the mission, work starts with individual interviews, observations in the field, review of the policies, programmes and procedures and discussions with counterparts in each of the OSART review areas. From 16:00 to 16:30 on every review day, the OSART members debrief the results of the day, discuss facts to obtain an agreement and the schedule for the next day with the counterparts. The OSART members prepare daily reports from 16:30 to 16:55 and then the OSART team holds its daily meeting to exchange information on main concerns from 17:00 to 18:00. The host plant peer is invited to attend the OSART daily team meetings and, if needed, provide additional clarification. During the review, each reviewer is expected to transform his or her daily notes into working notes, which ultimately form the basis of the Technical Notes of the OSART team.

On the first weekend, a meeting is held to discuss on the potential issues from the facts found during the first three-day review.

The last two days of the mission are reserved for completing the mission's Technical Notes, and for the team to reach consensus on all the recommendations, suggestions, self-identified issues, good practices, encouragement, and good performances. The review methodology and evaluation criteria are described in Section 4.

The team will perform the OSART mission in accordance with the Code of Conduct (see Annex II).

3.3.3. Exit meeting

The exit meeting, during which each OSART reviewer presents the results in his or her review area, takes place in the morning of the last day of the mission (usually a Thursday). This meeting is attended by senior management of the host organization, the regulatory body and any other concerned organizations, along with staff from the host organization. The dates of the OSART follow-up mission are also agreed between the host plant peer and the team leader. If requested by the host Member State, the IAEA (the team leader and an IAEA press officer) prepares a press release on the results of the OSART mission together with the host and the IAEA headquarters.

Upon completion of the exit meeting, the IAEA team leader could be invited to present during a press conference, if so requested and organized by the host organization. If the host organization requests a press conference, the host organization invites the IAEA press officer to support the press conference with at least three months' notice to the IAEA prior to the mission. The host organization normally covers funding for the press officer's travel.

3.4. REPORTING

This Section describes the reporting process of an OSART mission.

3.4.1. Technical notes

During the review, each team member writes notes on his or her observations and conclusions, including any potential recommendations, suggestions, self-identified issues or good practices. The Technical Notes are agreed by the OSART team and the host organizations, and are considered by the IAEA to be 'restricted documents'. Each recommendation, suggestion and self-identified issue contained in the Technical Notes makes reference to the relevant paragraph(s) of the IAEA safety standard(s) and/or the International Labour Office publication(s). A copy of the Technical Notes is given to the plant manager or representative of the host organization prior to the exit meeting.

3.4.2. The OSART report

On completion of the OSART review, the team leader will prepare the OSART report, based on the above Technical Notes. This is an official IAEA document, which summarizes the team's main observations and conclusions, including all recommendations, suggestions, self-identified issues and good practices. The report may also include encouragements for improvements on concerns that do not meet the definitions for recommendations or suggestions, respectively. The report may also include good performances that do not meet the definition of a good practice. Before the text is finalized, the host operating organization and regulatory body concerned have the opportunity to provide their comments. The final report is submitted through official channels to the Member State which requested the OSART. The copies of the report are sent to the country's Permanent Mission to the United Nations in Vienna, senior management of the host organization and the regulatory body. Good practices are published on the IAEA website and in the OSART mission Result (OSMIR) database immediately after the mission for the benefit of other Member States.

The IAEA restricts the initial distribution of the report to in-house users and to the host organization and the regulatory body involved. The report will be derestricted by the IAEA, 90 days after the submission to the Member State, unless the responsible person in the Member State requests that it remains restricted. To support the transparency of a national nuclear safety programme, the regulatory body, the host organization and/or relevant interested parties are encouraged to make the OSART report publicly available and to provide their consent enabling the IAEA to post the completed OSART report on its public website. The Agency will also incorporate the issues into the OSART Mission Result (OSMIR) database if the report is derestricted.

3.5. OSART FOLLOW-UP MISSION

This Section describes the process of conducting an OSART follow-up mission.

3.5.1. Follow-up mission planning

The OSART follow-up usually takes place 12–18 months after the original mission. The duration of the follow-up mission is 4–5 days, depending on the number of issues (i.e. recommendations and suggestions identified during the original OSART mission). The team leader determines the number of team members necessary for the mission, usually 1–4 members of the original OSART team, plus the team leader and the deputy team leader. The reason for using the original review team in the follow-up mission is to keep consistency of the scope and objectives until the mission is closed. The team leader liaises with the host organization and agrees on dates, financing and the contact details of the host plant peer for the follow-up mission.

Approximately three months prior to the follow-up mission, the IAEA produces the relevant format of the follow-up Technical Notes for the host organization to complete its responses, i.e. the original OSART report is amended by the following five additions:

- At the end of the INTRODUCTION AND MAIN CONCLUSIONS section, the sub-section entitled "[Installation's Name] Self-Assessment for the Follow-Up Mission", which the host organization completes prior to the mission;
- After the above sub-section entitled "[Installation's Name] Self-Assessment for the Follow-Up Mission", the sub-section entitled "OSART Team Follow-Up Main Conclusions", which the team leader completes at the end of the mission;
- After the IAEA basis of each issue, the sub-section entitled "Plant Response/Action", which the host organization completes prior to the mission;

- After the above “Plant Response/Action”, the sub-section entitled “IAEA Comments”, which the follow-up team members complete following review of the actions taken by the host organization on the issue;
- After the above “IAEA Comments”, the “Conclusion”, which is the team’s consensus opinion on the extent of resolution of the issue by the host organization.

Each “Plant Response/Action” should include the analysis conducted on the issue, the root cause identified, corrective action plans developed for the root cause, the progress to date on those actions, and the evaluation of the effectiveness for the corrective action. The description of “Plant Response/Action” should be limited to one or two pages.

This document is sent to the host organization so that they can complete its responses. Once it has been sent back to the IAEA, this document becomes the document used by the team leader for the start of the follow-up mission. This document containing the “Plant Response/Action” for all issues is sent one month in advance of the mission to all Follow-Up OSART team members. Prior to the follow-up mission, a preparatory meeting can be organized at the request of the host organization with the aim of providing support to strengthen the responses and actions.

If an exceptional circumstance (e.g. pandemic) is recognized at the planning phase, the follow-up mission could be conducted in two separate periods of time on a case by case basis, as follows:

- Period 1: Two to three experts from the original mission analyse the plant responses to the recommendations and suggestions, and produce the first draft of follow-up mission report. The team leader and the deputy team leader then analyse the draft report and discuss with experts to identify what additional information is required and if any observations/verifications are required to make a complete assessment. Period 1 concludes before Period 2.
- Period 2: The team leader and the deputy team leader visit the nuclear power plant or closely related organization for up to a week to obtain additional information and to undertake field observations and verifications. The team leader and the deputy team leader exchange information with the experts during the site visit and a copy of the draft report will be presented to the host organization at the end of the follow-up mission on the site.

This arrangement is different from the ‘staged approach’, which is applied considering the progress of the plant response(s) for the issue(s) as defined in Section 4.5.

3.5.2. The review of the plant response for issues

At the start of the mission, the team members agree to the review schedule with their counterparts and proceed in determining the status of resolution of the issues (i.e. recommendations, suggestions, self-identified issues) in accordance with the definitions of issue status, as indicated below. A team meeting is held each day, and the results of the review are discussed and agreed on where relevant. The host plant peer also participates in this meeting.

If during this evaluation a new significant safety finding is identified, the implications of such a finding needs to be discussed and agreed within the review team. Then the counterpart should be informed of the finding and the review team may look for other facts related to the finding to make an informed conclusion. If the finding meets the definitions for a recommendation or suggestion, the team leader presents the issue to the senior management for the host organization’s benefit and includes it in the full report.

In the exceptional case where an action plan for the resolution of recommendation or suggestion has just been implemented prior to the follow-up mission and there is no way to assess its progress and/or effectiveness and therefore, the definition of 'Insufficient progress to date', by its nature, cannot be applied, the OSART team and the senior management of the host organization may decide to use the 'Staged approach' (see Section 4.5). In addition, the approach taken in Section 4.5 can be used to address any new issues identified during the follow-up mission.

If a significant number[2] of issues show 'insufficient progress to date' during the follow-up mission, it will be recommended to the Member State that an invitation be issued for another follow-up mission in one year's time to evaluate further the progress on those issues classed as 'insufficient progress to date'. In such a case, a support mission or workshop can be offered to the host organization prior to the second follow-up mission.

An exit meeting is held on the last day of the mission, and this presents an opportunity for each team member to formally present the team's conclusions on each issue.

3.5.3. Final OSART mission report

Following the follow-up mission, the team leader ensures that a full report is prepared in accordance with the standard IAEA format, copies of which will be sent for review and comments to the host plant peer and the regulatory body, as was the case with the original OSART report. Copies of the final report are sent to the country's Permanent Mission to the United Nations in Vienna, senior management of the host organization, and the regulatory body.

4. REVIEW METHODOLOGY

4.1. REVIEW TECHNIQUES

Safe operation requires effective leadership, management, competent personnel, and strong safety culture as well as effective management system processes, programmes and procedures. The OSART review is a 2.5 week objective assessment to improve the operational safety of the nuclear power plant or the closely related organization. It does this by conducting a review of the application of the IAEA safety standards in key operational safety areas. It assesses the written procedures and also how the written procedures are being implemented in the field.

For this purpose, the OSART team typically uses the following techniques to acquire the information needed to develop its recommendations and suggestions, and to evaluate self-identified issues. These are:

- Reviews of documented information;
- Interviews with personnel and representatives of other organizations, for example contractors, technical support organizations, regulatory body, as appropriate;
- Direct observations of staff behaviours and performance in the field, equipment material conditions and housekeeping both at the site and at off-site facilities.

The process used to obtain information during the review of operational safety practices should be based on the above mentioned techniques, with a clear focus on essential aspects of safety and

[2] For example, the case that more than 50% of the 10 or more issues are classified as 'insufficient progress to date'.

performance with direct observations in the field having priority. As far as possible, observations of activities and facilities and interviews for personnel should serve as evidence to enable the reviewer to make an assessment of the operational safety performance. However, these review activities should be conducted effectively as time is limited.

To be able to make informed assessments, reviewers are expected to cover each topic to the extent necessary, based on the key elements contained in the WNOs for each of the specific review areas. Review findings should be described and supported by accurate notes containing several facts to the degree required to make the significance of findings understandable. Formulation of recommendations, suggestions and self-identified issues should be based on the identified gaps as compared to the IAEA safety standards. Meanwhile, good practices that are identified during the process of the review should be documented for the benefit of other Member States and described in the OSART report in sufficient detail as to be readily understood.

It is expected that operational activities during the OSART mission will follow the established work schedule, so that the team will be able to observe typical operational activities.

The reference publications for the basis of the OSART review are limited to the IAEA safety standards and the publications of the International Labour Office listed in the Bibliography. All other publications listed in the Bibliography, such as INSAG Series, Safety Reports Series, EPR Series, TECDOC and Services Series, introduce specific ways to realize the recommendations in the publications used for the basis and might be used in communication with counterparts, but are not included in the Technical Notes. It is noted that changes in the Bibliography will occur as the aforementioned publications are being revised. Therefore, at the time of the preparatory meeting, the list of reference publications to be used as IAEA basis, and the appropriate versions of the WNOs reflecting them, will be discussed.

Security issues out of the scope of the OSART review, but interfaces between safety and security should be reviewed to ensure that safety measures do not compromise security and security measures do not compromise safety. If such issues are identified by the team, they should be brought to the attention of the senior management of the host organization.

4.1.1. Documented information review

Document reviews familiarize experts with the full breadth of the organization’s documented information including, but not limited to management system documents and records, host organization, historical performance data and event investigations, the language and terminology used by various groups which provide a rich information and insight into review results and conclusions.

The aim of a document review is to gather information on the requirements and management expectations, including how the host organization prioritizes safety through its management system documentation and how responsibilities and authority are distributed in the organization. Document reviews provide the basis for insight into differences between stated intent and actual performance. The documented information may also be reviewed to check and confirm the information gathered during the interviews or direct observations.

4.1.2. Interviews

Interviews are another important method used in the OSART review process. Interviews are conducted with an individual or a small group of people and may be held face-to-face or virtually.

Interviews with personnel are used by the OSART team to:

- Gather additional information not covered by documentation review;
- Seek answers to questions and, thus, satisfy possible concerns arising out of the documentation review;
- Assess personnel's understanding of their duties and responsibilities;
- Assess personnel's competence, professionalism and commitment to nuclear safety;
- Provide the opportunity for all important information to be exchanged between reviewers and counterparts, and therefore should be held at the working level, between peers.

These interviews should be open discussions and not interrogations of the counterparts by the reviewers. Properly conducted, these interviews are an important part of the OSART mission.

4.1.3. Direct observation

Direct observation of operational and work activities underway is one of the most important aspects of the review process. A substantial part of the review period is spent observing behaviours and performance of plant staff in the field, including reviewing procedure adherence and use, application of human error prevention tools and operational and maintenance work practices. In addition, personnel may be interviewed to gain information regarding the understanding of tasks and possible safety consequences, their competence, technical knowledge and skills, attitudes and behaviours. The observation of work should include nuclear and industrial safety practices, use of procedures, drawings and instructions, use of quality control measures, accident training and emergency drills and supervision and management control of work. Section 5 of these guidelines provides practical advice to reviewers on conducting observations.

Based upon the reviews of documented information as well as interviews and observations, the reviewer can then assess performance. It may take several iterations of documented information reviews, interviews and observations to gain sufficient facts to complete an assessment.

4.2. DAILY REPORTING

During the interviews, documented information reviews, direct observations and walkdowns, the reviewer takes copious working notes to reflect facts, discussions and observations. Writing working notes is a step by step process which begins the first day and continues every day. In the evening, the reviewer enters notes in the WNOs.

The WNOs are the basis for reporting facts and developing issues and is used as a fact collecting and reporting document. It is a tool used:

- To document review results each day during the evening, including recognition of good practices;
- To develop, document and communicate draft issues; recommendations, suggestions, good practices (using the IAEA safety standards) and the evaluative description of each topic;
- As an aid in developing the Technical Notes.

The WNOs should include an assessment emphasizing how programmes and policies are established, implemented and what performance is being achieved, how procedures and instructions are being followed, and how effective actions are in improving performance.

Good working notes should contain:

- Simple words, short sentences and impersonal language;
- Official names of organizations, programmes and systems (with counterpart's help);
- Spelt out abbreviations when they are used for the first time.

The WNOs are to be followed to form a skeleton for interview topics and field observations. The working notes are then used to form the area summaries for the Technical Notes. The version of WNOs to be used in each mission is provided to the host organization by the team leader and the deputy team leader before the mission during the preparatory meeting. The identified version of WNOs is provided to the reviewers via the remote team training tool (see Section 3.2.5).

4.3. ISSUE DEVELOPMENT

Issue development starts by grouping similar collected facts under a common concern and theme. An issue statement is then formed by providing a description of a weakness as a standalone statement. The statement usually begins with one sentence describing the FOP which is followed by a group of the most significant supporting facts (described based on the working notes), and a short statement of safety consequence.

The FOP should be supported by facts, relate to underlying causes, and be stated in terms consistent with the facts.

A statement of safety consequence is one sentence on how this issue will affect or potentially affect safety if the FOP is not addressed by the host organization.

Based on the evaluation criteria described in Section 4.4, a recommendation or suggestion is proposed that logically results from the issue statement which:

- Begins with a one sentence statement of the basic improvement that should be achieved. This sentence should be inverse of the FOP;
- Describes what performance should be achieved, not how;
- Includes a specific vocabulary ('should' for recommendations and 'should consider' for suggestions).

The recommendation or suggestion is followed by the IAEA basis which contains the references to associated IAEA Safety Standards Series publications.

A simple check list to verify that the issue has the correct characteristics is shown below:

- Is the FOP described in one sentence?
- Does the FOP describe a problem, not a solution?
- Is the correct problem described in the FOP?
- Is the FOP adequately supported by the facts:
    - Are these facts directly addressing the FOP?
    - Are these facts agreed by the counterpart?
    - Does it contain at least one performance-based fact that could substantiate the FOP?
    - Is there a suitable balance between performance-based facts and programme-based facts? Or, in other words, are the programme-based facts supported by performance-based facts?
- Are the safety consequences clearly stated?

- Can the problem as stated be resolved?
- Is it worthy of the organization's attention?
- Can the issue be understood by a non-team member?
- Are the appropriate IAEA safety standards representing the IAEA basis referenced?

4.4. EVALUATION CRITERIA AND CONCLUSIONS OF THE OSART MISSION

The focus of an OSART mission is on identifying gaps in performance from the IAEA safety standards.

Other publications, such as INSAG reports, Safety Reports and TECDOCs, also provide additional information relevant to the OSART review. These publications are provided as the OSART materials prior to each mission. However, these publications cannot be the basis for finding an issue, and an issue should only be based on the appropriate paragraph(s) of any IAEA safety standard(s).

In the evening of each working day of the review, at the meeting called by the team leader, each expert summarizes his or her concerns developed during the day, including perceived strengths and weaknesses. This creates an opportunity for other team members to contribute their views, further strengthening the experience base of the evaluation.

The OSART review thus provides an objective comparison of the observed safety performance with the IAEA safety standards. This comparison may result in a recommendation, a suggestion, a good practice (see Fig. 2) or confirmation of a self-identified issue (see Glossary in this publication).

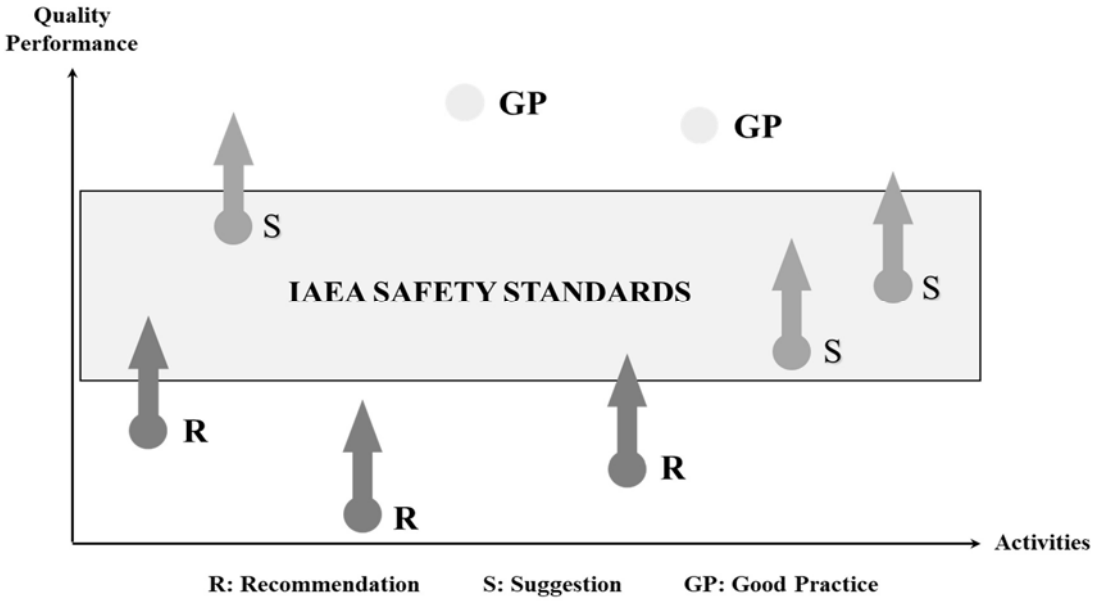

FIG. 2. Summarizing Recommendation, Suggestion, and Good Practice

4.5. EVALUATION CRITERIA AND CONCLUSIONS OF THE FOLLOW-UP MISSION

In the follow-up mission, the IAEA assessment of the progress achieved with the resolution of OSART recommendations, suggestions and self-identified issues is made, in accordance with the definitions in the following Sections 4.5.1. to 4.5.9.

4.5.1. Recommendation or Suggestion – Issue resolved

All necessary actions have been taken to deal with the root cause of a recommendation or suggestion rather than to just eliminate the facts identified by the team. A management review has been performed to ensure that actions taken have eliminated the root cause. Actions have also been taken to check that it does not recur. Alternatively, an issue is no longer valid due to, for example, changes in the operating organization.

4.5.2. Recommendation or Suggestion – Satisfactory progress to date

Actions have been taken, including root cause determination, which lead to a high level of confidence that a recommendation or suggestion will be resolved within a reasonable time frame, after the follow-up mission. These actions might include, for example, budget commitments, staffing, document preparation, increased or modified training, equipment purchases. This category implies that a recommendation or suggestion could not reasonably have been resolved prior to the follow-up mission, either due to its complexity or the need for long term actions. This category also includes recommendations and/or suggestions which have been resolved using temporary or informal methods, or when resolution has only recently taken place and its effectiveness has not been fully assessed.

4.5.3. Recommendation or Suggestion – Insufficient progress to date

Actions taken or planned do not lead to the conclusion that a recommendation or suggestion will be resolved within a reasonable time frame. This category includes recommendations and/or suggestions in response to which no action has been taken, barring recommendations and/or suggestions that have been withdrawn.

4.5.4. Self-identified issue – Issue resolved

All necessary actions have been taken, as defined in the self-assessment and the corresponding action plan, to address the root cause of an issue. A management review has been performed to ensure that actions taken have eliminated the issue. Actions have also been taken to check that it does not recur.

4.5.5. Self-identified issue – Satisfactory progress to date

Actions have been taken, as defined in the self-assessment made and the corresponding action plan to deal with the root cause and contributing causes, which lead to a high level of confidence that the issue will be resolved within a reasonable time frame.

4.5.6. Self-identified issue – Insufficient progress to date

The action plan developed to resolve the issue was not implemented as expected or did not achieve the expected results.

4.5.7. Recommendation or Suggestion – Withdrawn

The recommendation or suggestion is not appropriate due to, for example, a change in operating organization and/or structure, and/or the emergence of new, previously non-existent, circumstances associated with the identified issue.

4.5.8. Staged approach

In the exceptional case when an action plan for the resolution of recommendation or suggestion has just taken place prior to the follow-up mission and there is no way to assess its progress and/or effectiveness and, at the same time, the definition of 'insufficient progress to date', by its nature, cannot be applied, the IAEA team and the senior management of the operating organization may decide to come back to review the plant response to the recommendation or suggestion using a 'staged approach' in the course of the 'Second Stage' follow-up mission[3]. This case will be described in the Chapter 'First stage follow-up main conclusions' of the 'First stage follow-up report'. In case of application of the 'staged approach', a Member State will issue an invitation to the IAEA for a 'second stage follow-up' mission to be conducted in about one year after the first stage follow-up mission.

An application of the 'staged approach' towards recommendations and/or suggestions should be made by the host organization in advance, during the preparation phase for the follow-up mission, by notifying the team leader for the follow-up mission and appropriate information should be provided in the 'Technical Notes for the Follow-Up Mission'.

4.5.9. New issue during the follow-up mission

In exceptional cases, a new issue can be developed using the same format by the IAEA team during the follow-up mission, if a significant deviation directly affecting safety is observed and agreed within the team. Such an issue will be brought to the attention of the senior management of the operating organization by the team leader and an agreement reached on a suitable period of time to review the status of the actions taken to address the issue.

5. PRACTICAL TIPS FOR REVIEWERS

5.1. INTRODUCTION

The process used to obtain information during the review of operational safety practices in a nuclear power plant or closely related organization should be based on observations, interviews and document reviews, with a focus on essential aspects of operational safety performance.

As far as possible, observations of activities and facilities and interviews for personnel should serve as evidence to enable the reviewer to assess the operational safety performance. However, these review activities should be conducted effectively within the limited time. This Section provides practical tips for performing document reviews, observations and interviews effectively.

5.2. DOCUMENTED INFORMATION REVIEW

Review of documented information is a sound way of collecting data by reviewing existing documents and records. It helps to verify compliance, with management values and expectations, clarity of roles and authorities, and accuracy and effectiveness of working procedures. The review may also provide insights related to work practices and safety performance at the nuclear installation. The evidence and data gained from documented information analysis usually provides additional supporting information to be used during other assessment methods.

[3] A reasonable time frame is normally considered as one year and a half (maximum) from the time of the follow-up mission.

Examples of documents of general interest to the whole review team are included in the AIP. In addition, during the review, each expert will review documented information, specific to his or her areas and used by the host organization, such as (non-exhaustive list):

- Policies, programmes and plans;
- Organization structure and job descriptions;
- Goals, objectives and key performance indicators;
- Operating and maintenance procedures;
- Operation records and operating experience information including event and incident reports;
- Surveillance tests and maintenance records;
- Databases and registers;
- Records on permanent and temporary modifications;
- Training programmes and qualification records;
- Minutes of meetings and reports;
- Assessment and quality records, including corrective and improvement actions.

5.2.1. Performing documented information review

To obtain valuable data from the documented information review it is essential to define clearly what documents or records are required. For this purpose, the set of WNOs should be used.

Documented information offers specific and stable data, which is unaffected by the presence of interviewee and reviewer. Additionally, it helps to focus on the questions that might be asked in interviews and to better understand what to look for during observations. It is particularly useful when focusing on a particular aspect of the review area is required.

The themes underlying the review of the documented information include the following considerations:

- Consistency and inconsistency of documented information (e.g. chronology) in various sources;
- Prioritization of safety aspects across the documented information;
- Accuracy and validity of presented information, including alignment with the IAEA safety standards;
- Missing documentation (e.g. procedures, work instructions and flowcharts);
- Backlogs (e.g. delayed actions, maintenance, temporary modifications, procedure revisions);
- Adequacy of configuration control arrangements for operation, maintenance and surveillance activities, and design integrity;
- Culture for safety and human factor management;
- Availability of trend information and its use;
- Depth of root cause analyses in terms of organizational issues;
- Timeliness of actions taken to address safety concerns.

5.2.2. Documented information review techniques

Documented information could be reviewed from the following perspectives:

- Document quality: assess in terms of structure, format and content, and in particular for the presence or absence of safety focus, operating experience and best practice;
- Information consistency: where possible, several documents of the same type are reviewed to assess the extent to which the information from various sources is consistent or inconsistent;
- Validity: check if the document has required requisites (e.g. date of issue, signatures, revision number and time frame for validity, when applicable);
- Document usability: while difficult to assess by document review, some indirect indicators related to the use or implementation of a document could be considered (e.g. clear, comprehensive and user friendly).
- Consistency with reference publications: check if the document is in-line with reference publications (e.g. the IAEA safety standards).

5.3. INTERVIEWS

The main objective of the interviews is to gather additional information not covered by documented information review or direct observations. Interviews allow for a greater flexibility in questioning, with the possibility for follow-up questions, making it easier to gain a better understanding of the approach or philosophy of the organization, to 'unfold' the actual organizational processes and to obtain deeper meanings. They can also show how people interpret policies and programmes, safety concerns or events and learn from these.

Considering that interviews are not anonymous, and therefore can evoke caution or anxiety in the interviewees, a cautious approach should be taken to the interpretation of the information gained from the interview as the interviewee may not feel comfortable; this could diminish the quality of information gained. Thus, it is important to inform the interviewee about the purpose of the interview and that the results of interviews should be treated as a reflection on an organizational or programmatic characteristic, not of an individual, and no name will be recorded to ensure anonymity outside the interview room.

5.3.1. Conducting interviews

Interviews can be very stressful, but the key to decreasing the stress and increasing the benefits is the selection of a right format and careful interview preparation. Interviews are complex interactions and hence have limitations. Therefore, several aspects need to be taken into account during the preparation:

- What to ask: consider which topics and activities should be discussed and develop a list of several significant questions to confirm staff understanding of programmes they are involved in, safety implications of their duties and responsibilities, competence, and commitment to safety, in line with the WNOs;
- How to ask: use a mix of closed questions and open questions, where the interviewee can answer in a way that provides explanations of how and why[4];
- Who and when to ask: to be arranged with the counterparts in advance; permission or attendance of an individual or a small group needs to be discussed beforehand to ask their subordinates and contractors for a next day interview.

At the beginning of the interview, the reviewer should explain the topic(s) to be discussed. The interviewee should understand that the purpose of the interview is not to collect personal opinion or complaints, but to have additional insights to programmes and practices. It is also important to choose the right place and the right time for the interview, if possible.

Depending on the type of interview, questions play a significant role in shaping the content and flow of conversation. The interviewer should use general questions to gather information on specific topics, for example: “Can you explain how operational safety decisions are made?” Review of the related documented information may be a part of the interview, but it should be requested at appropriate times, when it is necessary to confirm interviewee statements or provide additional details for deeper understanding of the topic discussed.

Interviewees are sensitive to the behaviour of the interviewer; therefore, their efficiency could be increased by following simple rules or protocol:

For the interviewer:

- Be polite, listen carefully and avoid the impression of interrogation;
- Maintain an inquisitive attitude;
- Keep an open mind and remove barriers (noise, perception and prejudice, stress, distortions, intrusion of personal space (keep the right distance);
- Focus on facts, ask for confirmation, do not lecture on how you did, how you do, or how you will do;
- Do not assume — ask additional questions;
- Maintain a professional attitude at all times.

[4] The interviewer may use closed questions to check whether their understanding is correct or not. Such closed questions could be used to follow-up on negative facts, which can be stressful for the interviewees. Therefore, the interviewer should use open questions as much as possible, so that his or her questions are ones that will get people talking about good practices as well, not just looking for negative gaps.

For the interviewee:

- Be relaxed and provide the answer to your best knowledge;
- If the asked question is not in your scope of work, suggest the right person to answer.

For both interviewer and interviewee:

- Establish trust and good relationship;
- Make sure your words are clear and easy to understand and avoid jargon;
- If you do not understand the question or answer, ask for clarification (do not assume);
- Be aware and respect the difference of communication cultures of each other, but maintain a straightforward and unambiguous communication;
- Control and try to interpret body language positively.

In cases when simple answers like "Yes" or "No" are provided, subsequent open questions (using 'how' or 'why') could be developed to identify particular problems. Notes from the interviews are important to be kept allowing for an appropriate follow-up of the interview (including summarizing results with the counterpart(s) at the end of the interview).

5.3.2. Interview techniques

Some useful tips for the success of interviews:

- Allow the WNOs and data from the team review to define the aspects to be discussed and questions to be asked;
- Make sure that the questions are clear and unambiguous;
- Ask the most important questions to a number of different people (if possible);
- When interviewing a small group, consider differences and inconsistencies in reasoning and perceptions;
- Remain conscious of interpretation bias (preconception);
- Do not provoke or criticise the senior management;
- Be aware of the degree of confidentiality that interviewees can expect;
- Take notes of the facts and documents presented to confirm statements or facts[5];
- When interviewing through an interpreter, consider making sure that the question is correctly understood and changing the way to ask questions in order to obtain clear answers.

5.4. OBSERVATIONS

A fundamental part of the OSART methodology is the observation of ongoing activities. The performance of several individuals is likely to be representative of all personnel within a discipline or group. The results of management efforts to implement policy and procedures, and the effectiveness of training, are demonstrated by these individuals. Therefore, it is inappropriate to treat the conclusions of any observation as a reflection on an individual. Instead, the results of observations should be treated as being characteristic of the functioning of the organization, and the persons involved should remain anonymous.

[5] In some cases, it may be best to keep notetaking to a minimum (e.g, writing down questions that come to mind during an interview), as notetaking can interfere with natural conversation and make interviewees uncomfortable.

The final and most important part of the review process is the determination of the quality of the results being achieved by the host organization. A significant portion of each review, therefore, is devoted to observing personnel performing their day-to-day work. By refining his or her observation skills, the expert can see conditions and situations that are generally symptomatic. Attention to detail is paramount. The expert should have a broad outlook and be critical of their surroundings and of ongoing activities. Information obtained through observation becomes an important component of the basis for the overall review results.

In selecting an activity and planning for the observation segment of the review, there are several questions that can be considered to help decide on the most beneficial activities to observe. Some basic questions, with commentary, include the following:

- Is the system/work important to safety? Observations need not necessarily involve safety related work; however, if the work is safety related or important to safety, the results of the observations will carry considerably more weight. That is, work important to safety should be controlled in a manner that promotes excellence. If deficiencies in this type of work are noted, they may be significant in themselves.
- Is the work of sufficient complexity that a written procedure has been developed? For many of the activities that are observed, a procedure has been developed to ensure that specific steps are accomplished in a required manner, such that the end product meets the required quality standard.
- Does the work involve several departments or disciplines? Observations on the work that require the cooperative effort of several elements of the organization often provide a significant input to evaluate the host organization.

In selecting an activity to observe, the expert is looking for performance of an individual that is representative of the ability to train its personnel and implement its policies and procedures. With an appropriate selection of activities, the results of the observations will provide an overall reflection of the host organization's performance. Care should be taken not to identify the individual involved in the observation.

5.4.1. Conducting observations

Preparation is the key element of all phases of an observation. The two most important parts of the preparation phase are the determination of 'what' and 'when'. The 'what to observe' can be determined by establishing a liaison with the host organization to ascertain what activities will be going on during the period of the review. This will enable the expert to plan for specific activities and to conduct the necessary research and study. Other activities will be observed as they arise. The 'when to observe' question is answered best by 'the earlier the better'. By conducting direct observations in the first few days of an OSART mission, the reviewer gains considerable insight into potential areas of concern. This then enables the reviewer to properly direct their activities during the remainder of the mission. The guiding principle for preparation is for the reviewer to read the appropriate IAEA safety standards, procedures, and similar documents, prior to observing any activity or facility.

Establishing good relationships with the individuals under observation is important. They should understand that the purpose of the observation is not to criticize them personally, but to look for possible improvements as well as good performance. Except in the case of an immediate hazard to plant equipment or personnel safety, reviewers should not interfere with plant evolutions. Any unsafe deficiencies should be corrected as soon as possible, however, the corrective actions, such as revision of procedures or training, should not be taken immediately, but should be taken based on the root

causes identified following the result of the review. Questions are a necessary part of any observation, but should only be asked at appropriate times, when they do not adversely affect the performance of the individual being questioned.

The expert should be looking, in a broad manner, at many items during the observation process. As well as observing the activity taking place the reviewer should also consider asking some additional questions to gain a broader understanding of the factors which could influence the way the activity is being conducted.

- To what degree do the individuals being observed understand the basic objectives and policies of the host organization regarding quality work and adherence to procedures?
- What training have the individuals received that relates to their activities during this observation?
- Do the individuals involved in task performance communicate effectively and ensure peer check?
- What is the industrial safety and material conditions in all areas encountered during this observation?
- Do supervisors monitor the work activity? Do they provide appropriate guidance and training?

After observing the work activity, the reviewer should thank the observed staff and offer their feedback before leaving. The reviewer should then analyse their observations and identify facts (deviations from standards) and/or good practices. This process generally results in the need for follow-up action to resolve unanswered questions. This follow-up may require a return to the physical area of the facility to confirm initial conclusions or gather further information.

In the field, the reviewer should ask their counterpart to take as many pictures as necessary to illustrate facts collected. Care should be taken to ensure that photographs do not identify individuals. In addition, instructions from the host organization should be followed with regard to items that should not be taken for security reasons. Pictures will be downloaded into the Local Area Network (LAN) as soon as possible.

5.4.2. Observation techniques

- Take detailed notes which should be factual, accurate and sufficiently detailed — sometimes apparently irrelevant material becomes meaningful when analysing and summarizing an activity.
- Log the time when taking notes. These can be used to correlate both plant responses and personnel actions noted by other reviewers in other areas of the facility.
- Include document numbers and other reference information for follow-up.
- Include questions and items to follow-up in the notes. Information could be lost if memory is trusted for recall later.
- Include the preparatory activities being undertaken for the observation, if possible. Watch the tagout. Watch how the personnel gather tools and parts.
- Do not assume — ask questions. Even if operator A told you the answer, ask operator B (however, do not entrap people).
- Constantly ask yourself, ‘Why is the person being observed doing that? Is it the correct thing to do?’ Note details.

- Do not just observe the activity, observe the individual(s) and the surroundings. Look under, over, and around. Think beyond the evolution, for example:
    - Why does the snubber not have oil in it?
    - Why is the wrench in use painted red?
    - Where did that instrument come from?
    - Why does the operator keep changing settings?
    - How many management personnel have I seen?
- Follow-up after the evolution is completed. Track paperwork, review the job with supervisors, and question those who performed the task.
- For evolutions of a longer duration, make periodic observations. Several 30-minute periods spread throughout the day can be more meaningful than one three hour period;
- Ask for the relevant work procedure in advance to get familiar with the work process.

5.5. WORKING WITH COUNTERPARTS

It is important to keep an open mind and establish a good cooperative relationship early to gain the trust and support of counterparts by professional and honest interactions. The counterpart should be encouraged to take joint responsibility for the quality of the review by helping to maintain the review schedule and obtain correct and complete information so that the reviewer has a complete and accurate understanding.

A strong supportive relationship between the reviewer and the counterpart creates the opportunity for high quality issues to be identified and increases the sense of ownership of the issues by the counterpart at the end of the mission.

6. SPECIFIC GUIDELINES

6.1. LEADERSHIP AND MANAGEMENT FOR SAFETY

The safe and reliable operations of a nuclear power plant imply the management of numerous activities in various areas — including nuclear safety, health, radiation protection, non-radiation safety, environment, security, quality — and of social and economic elements. All these elements should be integrated into a management system to ensure that safety is not compromised and remains the first priority. Senior management should establish, implement and continuously improve the integrated management system, and should determine and provide the competences and (human and other) resources necessary to conduct the activities of the organization.

The integrated management system should also describe responsibilities, lines of authority within the organization, and interfaces with external organizations.

The evaluation of leadership and management for safety includes a review of the effectiveness of the integrated management system in ensuring and enhancing safety.

The strength of this review is the identification of common themes through the integration of information collected from all the other review areas of the OSART as well as additional information collected by the reviewer for this area. The additional information is collected to better understand how the values, attitudes, and beliefs of plant personnel impact their interaction with the technology and organization.

This review area includes identifying cross cutting findings that result from the human factors management and safety culture. The complexity of nuclear installation operations has been increasing because of higher standards of safety, downward pressure on resources, increased regulatory requirements, and the accumulation of operating experience. Consequently, to ensure that safety is maintained in this complex environment, an approach to safety is needed which considers human factors and cultural drivers impacting plant operations.

During the review, appropriate attention should be paid to special features of organizational culture for safety, which may have a strong influence on management practices. However, the OSART review focuses on the artefacts (observables including behaviour) and the values (claimed and tacit) that can be identified during the OSART mission. For a full assessment of the safety culture, a methodology applying a broader use of data collection methods and cultural analysis is needed. This is provided in the IAEA Independent Safety Culture Assessment[6] (ICSA) which is offered as an add-on area of review in the frame of an OSART mission.

IAEA Basis[7]

SSR-2/2 (Rev.1) [2]; SF-1 [3]; GSR Part 2 [4]; GSR Part 4 (Rev.1) [5]; GS-G-3.1 [6]; GS-G-3.5 [7]; SSG-28 [8]; SSG-71 [9]; SSG-72 [10]; SSG-74 [11]; SSG-75 [12]; SSG-76 [13]; SSG-77 [14]; ILO-OSH 2001 [42], ILO – Safety and health in construction [43], ILO – Safety in the use of chemicals at work [44].

Key Requirements

> "The registrant or licensee — starting with the senior management — shall ensure that the fundamental safety objective of protecting people and the environment from harmful effects of ionizing radiation is achieved" (GSR Part 2 Requirement 1 [4]).
>
> "Managers shall demonstrate leadership for safety and commitment to safety" (GSR Part 2 Requirement 2 [4]).
>
> "Senior management shall be responsible for establishing, applying, sustaining and continuously improving a management system to ensure safety" (GSR Part 2 Requirement 3 [4]).
>
> "Senior management shall establish goals, strategies, plans and objectives for the organization that are consistent with the organization's safety policy" (GSR Part 2 Requirement 4 [4]).
>
> "Senior management shall ensure that appropriate interaction with interested parties takes place" (GSR Part 2 Requirement 5 [4]).
>
> "The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, social and economic elements, so that safety is not compromised" (GSR Part 2 Requirement 6 [4]).

[6] An Independent Safety Culture Assessment provides deeper insight into the drivers that shape organizational patterns of behaviours, safety consciousness, and safety performance. By combining a safety culture assessment with an OSART mission, facilities gain a snapshot-in-time of their operating safety performance and the cultural dimensions that influence these results. By exploring the connection between OSART findings and safety culture findings, facilities can begin to identify and systematically address systemic challenges to safety performance.

[7] IAEA Basis and key requirements in all subsections are consistent with the version of WNOs.

“The management system shall be developed and applied using a graded approach” (GSR Part 2 Requirement 7 [4]).

“The management system shall be documented. The documentation of the management system shall be controlled, usable, readable, clearly identified and readily available at the point of use” (GSR Part 2 Requirement 8 [4]).

“Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them” (GSR Part 2 Requirement 9 [4]).

“Processes and activities shall be developed and shall be effectively managed to achieve the organization’s goals without compromising safety” (GSR Part 2 Requirement 10 [4]).

“The organization shall put in place arrangements with vendors, contractors and suppliers for specifying, monitoring and managing the supply to it of items, products and services that may influence safety” (GSR Part 2 Requirement 11 [4]).

“Individuals in the organization, from senior managers downwards, shall foster a strong safety culture. The management system and leadership for safety shall be such as to foster and sustain a strong safety culture” (GSR Part 2 Requirement 12 [4]).

“The effectiveness of the management system shall be measured, assessed and improved to enhance safety performance, including minimizing the occurrence of problems relating to safety” (GSR Part 2 Requirement 13 [4]).

“Senior management shall regularly commission assessments of leadership for safety and of safety culture in its own organization” (GSR Part 2 Requirement 14 [4]).

“A graded approach shall be used in determining the scope and level of detail of the safety assessment carried out at a particular stage for any particular facility or activity, consistent with the magnitude of the possible radiation risks arising from the facility or activity” (GSR Part 4 (Rev.1) Requirement 1 [5]).

“The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant” (SSR-2/2 (Rev.1) Requirement 1 [2]).

“The operating organization shall establish, implement, assess and continually improve an integrated management system” (SSR-2/2 (Rev.1) Requirement 2 [2]).

“The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented” (SSR-2/2 (Rev.1) Requirement 3 [2]).

“The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant” (SSR-2/2 (Rev.1) Requirement 4 [2]).

“The operating organization shall establish and implement operational policies that give safety the highest priority” (SSR-2/2 (Rev.1) Requirement 5 [2]).

“The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons” (SSR-2/2 (Rev.1) Requirement 7 [2]).

"The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8 [2]).

"The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization" (SSR-2/2 (Rev.1) Requirement 9 [2]).

"The operating organization shall establish and maintain a system for the control of records and reports" (SSR-2/2 (Rev.1) Requirement 15 [2]).

"The operating organization shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency" (SSR-2/2 (Rev.1) Requirement 18 [2]).

"The operating organization shall establish and implement a programme for the management of radioactive waste" (SSR-2/2 (Rev.1) Requirement 21 [2]).

"The operating organization shall establish and implement a programme to ensure that safety related risks associated with non-radiation-related hazards to personnel involved in activities at the plant are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 23 [2]).

"The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24 [2]).

6.2. TRAINING AND QUALIFICATION

To achieve and maintain high safety standards, nuclear installations are required to be staffed by an adequate number of highly qualified and experienced personnel. To establish and maintain a high level of personnel competence, appropriate training and qualification programmes should be established at the plant and kept under constant review, to ensure their relevance to staff needs. It is the responsibility of the operating organization to ensure that all plant personnel receive appropriate training, and that only personnel with suitable qualifications are assigned job functions at the nuclear installation. During employment, qualifications are maintained by participation in continuing training programmes that are directed towards maintaining and upgrading the knowledge and skills of personnel.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GS-G-3.1 [6]; SSG-3 [15]; SSG-25 [16]; SSG-28 [8]; SSG-71 [9]; SSG-72 [10]; SSG-74 [11]; SSG-75 [12]; SSG-76 [13]; SSG-77 [14].

Key Requirements

"The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1 [2]).

"The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented" (SSR-2/2 (Rev.1) Requirement 3 [2]).

"The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons" (SSR-2/2 (Rev.1) Requirement 7 [2]).

"The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8 [2]).

"The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation" (SSR-2/2 (Rev.1) Requirement 10 [2]).

"The operating organization shall establish and implement a programme to manage modifications" (SSR-2/2 (Rev.1) Requirement 11 [2]).

"Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources" (SSR-2/2 (Rev.1) Requirement 12 [2]).

"The operating organization shall establish and maintain a system for the control of records and reports" (SSR-2/2 (Rev.1) Requirement 15 [2]).

"The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24 [2]).

6.3. OPERATIONS

The main function of operations is to run the plant safely and efficiently while adhering to approved procedures, operational limits and conditions and other regulatory requirements. Through its conduct of operations, the operating group has a direct impact on the operation of the reactor and associated components and systems. While the structure of the group varies according to the specific plant or operating organization, the group is normally composed of shift crews and supporting staff and is usually managed by an appointed head of operations. The shift supervisor manages plant operations on each shift. In addition to this, for the purpose of defining review responsibilities in these guidelines, operations cover plant's operation facilities, operator aids, work authorizations, fire protection, and plant accident conditions.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GS-G-3.1 [6]; SSG-3 [15]; SSG-25 [16]; SSG-28 [8]; SSG-70 [17]; SSG-72 [10]; SSG-73 [18]; SSG-74 [11]; SSG-75 [12]; SSG-76 [13]; SSG-77 [14].

Key Requirements

"The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1 [2]).

"The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant" (SSR-2/2 (Rev.1) Requirement 4 [2]).

"The operating organization shall establish and implement operational policies that give safety the highest priority" (SSR-2/2 (Rev.1) Requirement 5 [2]).

"The operating organization shall ensure that the plant is operated in accordance with the set of

operational limits and conditions" (SSR-2/2 (Rev.1) Requirement 6 [2]).

"The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons" (SSR-2/2 (Rev.1) Requirement 7 [2]).

"The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8 [2]).

"The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization" (SSR-2/2 (Rev.1) Requirement 9 [2]).

"The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation" (SSR-2/2 (Rev.1) Requirement 10 [2]).

"The operating organization shall establish and implement a programme for the management of radioactive waste" (SSR-2/2 (Rev.1) Requirement 21 [2]).

"The operating organization shall make arrangements for ensuring fire safety" (SSR-2/2 (Rev.1) Requirement 22 [2]).

"The operating organization shall establish and implement a programme to ensure that safety related risks associated with non-radiation-related hazards to personnel involved in activities at the plant are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 23 [2]).

"The operating procedures shall be developed that apply comprehensively (for the reactor and its associated facilities) for normal operation, anticipated operational occurrences and accident conditions, in accordance with the policy of the operating organization and the requirements of the regulatory body" (SSR-2/2 (Rev.1) Requirement 26 [2]).

"The operating organization shall ensure that operations control rooms and control equipment are maintained in a suitable condition" (SSR-2/2 (Rev.1) Requirement 27 [2]).

"The operating organization shall develop and implement programmes to maintain a high standard of material condition, housekeeping and cleanliness in all working areas" (SSR-2/2 (Rev.1) Requirement 28 [2]).

"The operating organization shall be responsible and shall make arrangements for all activities associated with core management and with on-site fuel handling" (SSR-2/2 (Rev.1) Requirement 30 [2]).

"The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented" (SSR-2/2 (Rev.1) Requirement 31 [2]).

6.4. MAINTENANCE

Nuclear installations should be regularly inspected, tested and maintained in accordance with approved procedures to ensure that structures, systems and components (SSCs) continue to function as designed and to operate as intended, and retain their capability to meet the design objectives and

requirements of the safety analysis. The operating organization should prepare and implement a programme of maintenance, testing, surveillance and inspection of those SSCs which are important to safety.

For the purpose of these guidelines, maintenance covers in-service inspection, spare parts, materials and outage management.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 2 [4]; GSG-7 [19]; GS-G-3.1 [6]; GS-G-3.5 [7]; SSG-3 [15]; SSG-25 [16]; SSG-28 [8]; SSG-30 [20]; SSG-40 [21]; SSG-48 [22]; SSG-50 [23]; SSG-71 [9]; SSG-72 [10]; SSG-73 [18]; SSG-74 [11]; SSG-75 [12]; SSG-76 [13]; SSG-77 [14].

Key Requirements

"Managers shall demonstrate leadership for safety and commitment to safety (GSR Part 2 Requirement 2) [4].

"Senior management shall establish goals, strategies, plans and objectives for the organization that are consistent with the organization's safety policy" (GSR Part 2 Requirement 4) [4].

"Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them" (GSR Part 2 Requirement 9) [4].

"Processes and activities shall be developed and shall be effectively managed to achieve the organization's goals without compromising safety" (GSR Part 2 Requirement 10) [4].

"The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1) [2].

"The operating organization shall establish, implement, assess and continually improve an integrated management system" (SSR-2/2 (Rev.1) Requirement 2) [2].

"The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented" (SSR-2/2 (Rev.1) Requirement 3) [2].

"The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant" (SSR-2/2 (Rev.1) Requirement 4) [2].

"The operating organization shall establish and implement operational policies that give safety the highest priority" (SSR-2/2 (Rev.1) Requirement 5) [2].

"The operating organization shall ensure that the plant is operated in accordance with the set of operational limits and conditions" (SSR-2/2 (Rev.1) Requirement 6) [2].

"The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons" (SSR-2/2 (Rev.1) Requirement 7) [2].

"The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8) [2].

“The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization” (SSR-2/2 (Rev.1) Requirement 9) [2].

“The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation” (SSR-2/2 (Rev.1) Requirement 10) [2].

“The operating organization shall establish and implement a programme to manage modifications” (SSR-2/2 (Rev.1) Requirement 11) [2].

“The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant” (SSR-2/2 (Rev.1) Requirement 14) [2].

“The operating organization shall establish and implement a radiation protection programme” (SSR-2/2 (Rev.1) Requirement 20) [2].

“The operating organization shall make arrangements for ensuring fire safety” (SSR-2/2 (Rev.1) Requirement 22) [2].

“The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide” (SSR-2/2 (Rev.1) Requirement 24) [2].

“The operating organization shall develop and implement programmes to maintain a high standard of material condition, housekeeping and cleanliness in all working areas” (SSR-2/2 (Rev.1) Requirement 28) [2].

“The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented” (SSR-2/2 (Rev.1) Requirement 31) [2].

“The operating organization shall establish and implement arrangements to ensure the effective performance, planning and control of work activities during outages” (SSR-2/2 (Rev.1) Requirement 32) [2].

6.5. TECHNICAL SUPPORT

Technical support covers all the on-site activities of the technical and engineering groups involved in safety assessment, surveillance testing, plant performance monitoring, plant modifications, reactor engineering, fuel handling, and application of plant process computers. The integration of technical support — with its specialist functions — into the operating organization is important to support and ensure the safe operation of the nuclear installation.

IAEA Basis

SSR-2/2 (Rev.1) [2]; SF-1 [3]; GSR Part 2 [4]; GSR Part 4 (Rev.1) [5]; SSR-2/1 (Rev.1) [24]; GS-G-3.1 [6]; GSG-3.5 [7]; SSG-2 (Rev.1) [25]; SSG-3 [15]; SSG-25 [16]; SSG-28 [8]; SSG-38 [26]; SSG-39 [27]; SSG-48 [22]; SSG-50 [23]; SSG-61 [28]; SSG-70 [17]; SSG-71 [9]; SSG-72 [10]; SSG-73 [18]; SSG-74 [11]; SSG-75 [12]; SSG-76 [13]; SSG-77 [14].

Key Requirements

"Senior management shall establish goals, strategies, plans and objectives for the organization that are consistent with the organization's safety policy" (GSR Part 2 Requirement 4) [4].

"The management system shall be documented. The documentation of the management system shall be controlled, usable, readable, clearly identified and readily available at the point of use" (GSR Part 2 Requirement 8) [4].

"Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them" (GSR Part 2 Requirement 9) [4].

"The effectiveness of the management system shall be measured, assessed and improved to enhance safety performance, including minimizing the occurrence of problems relating to safety" (GSR Part 2 Requirement 13) [4].

"Senior management shall regularly commission assessments of leadership for safety and of safety culture in its own organization" (GSR Part 2 Requirement 14) [4].

"A graded approach shall be used in determining the scope and level of detail of the safety assessment carried out at a particular stage for any particular facility or activity, consistent with the magnitude of the possible radiation risks arising from the facility or activity" (GSR Part 4 (Rev.1) Requirement 1) [5].

"The responsibility for carrying out the safety assessment shall rest with the responsible legal person; that is, the person or organization responsible for the facility or activity" (GSR Part 4 (Rev.1) Requirement 3) [5].

"The primary purposes of the safety assessment shall be to determine whether an adequate level of safety has been achieved for a facility or activity and whether the basic safety objectives and safety criteria established by the designer, the operating organization and the regulatory body, in compliance with the requirements for protection and safety as established in Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, have been fulfilled" (GSR Part 4 (Rev.1) Requirement 4) [5].

"The possible radiation risks associated with the facility or activity shall be identified and assessed" (GSR Part 4 (Rev.1) Requirement 6) [5].

"All safety functions associated with a facility or activity shall be specified and assessed" (GSR Part 4 (Rev.1) Requirement 7) [5].

"It shall be determined in the safety assessment for a facility or activity whether adequate measures are in place to protect people and the environment from harmful effects of ionizing radiation" (GSR Part 4 (Rev.1) Requirement 9) [5].

"It shall be determined in the safety assessment whether a facility or activity uses, to the extent practicable, structures, systems and components of robust and proven design" (GSR Part 4 (Rev.1) Requirement 10) [5].

"Human interactions with the facility or activity shall be addressed in the safety assessment, and it shall be determined whether the procedures and safety measures that are provided for all normal operational activities, in particular those that are necessary for implementation of the operational

limits and conditions, and those that are required for responding to anticipated operational occurrences and accident conditions, ensure an adequate level of safety" (GSR Part 4 (Rev.1) Requirement 11) [5].

"The performance of a facility or activity in all operational states and, as necessary, in the post-operational phase shall be assessed in the safety analysis" (GSR Part 4 (Rev.1) Requirement 14) [5].

"The safety assessment shall be periodically reviewed and updated" (GSR Part 4 (Rev.1) Requirement 24) [5].

"The design basis for items important to safety shall specify the necessary capability, reliability and functionality for the relevant operational states, for accident conditions and for conditions arising from internal and external hazards, to meet the specific acceptance criteria over the lifetime of the nuclear power plant" (SSR-2/1 (Rev.1) Requirement 14) [24].

"The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant" (SSR-2/2 (Rev.1) Requirement 4) [2].

"The operating organization shall establish and implement operational policies that give safety the highest priority (SSR-2/2 (Rev.1) Requirement 5) [2].

"The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8) [2].

"The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization" (SSR-2/2 (Rev.1) Requirement 9) [2].

"The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation" (SSR-2/2 (Rev.1) Requirement 10) [2].

"The operating organization shall establish and implement a programme to manage modifications" (SSR-2/2 (Rev.1) Requirement 11) [2].

"Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources" (SSR-2/2 (Rev.1) Requirement 12) [2].

"The operating organization shall ensure that a systematic assessment is carried out to provide reliable confirmation that safety related items are capable of the required performance for all operational states and for accident conditions" (SSR-2/2 (Rev.1) Requirement 13) [2].

"The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant" (SSR-2/2 (Rev.1) Requirement 14) [2].

"The operating organization shall establish and maintain a system for the control of records and reports" (SSR-2/2 (Rev.1) Requirement 15) [2].

"Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the long term safe operation of the plant beyond a time-frame established in the licence conditions, design limits, safety standards and/or regulations" (SSR-2/2 (Rev.1) Requirement 16) [2].

"The operating organization shall ensure that the implementation of safety requirements and security requirements satisfies both safety objectives and security objectives" (SSR-2/2 (Rev.1) Requirement 17) [2].

"The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24) [2].

"The operating procedures shall be developed that apply comprehensively (for the reactor and its associated facilities) for normal operation, anticipated operational occurrences and accident conditions, in accordance with the policy of the operating organization and the requirements of the regulatory body" (SSR-2/2 (Rev.1) Requirement 26) [2].

"The operating organization shall be responsible and shall make arrangements for all activities associated with core management and with on-site fuel handling" (SSR-2/2 (Rev.1) Requirement 30) [2].

"The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented" (SSR-2/2 (Rev.1) Requirement 31) [2].

"The operating organization shall establish and implement arrangements to ensure the effective performance, planning and control of work activities during outages" (SSR-2/2 (Rev.1) Requirement 32) [2].

6.6. OPERATING EXPERIENCE FEEDBACK

A well implemented operating experience feedback (OEF) programme is characterized by the following features:

- The management aligns the organization to effectively implement the OEF programme in order to improve safety and reliability of the plant.
- OEF is reported in a timely manner to reduce the potential for recurring events in-house and in the nuclear industry.
- Sources of OEF are considered in the OEF programme to improve safety and reliability from lessons learned.
- OEF information is appropriately screened to select and prioritize those items requiring further investigation.
- Analysis is performed for appropriate events, depending on their severity or frequency, to ensure root causes and corrective actions are identified.
- Corrective actions are defined, prioritized, scheduled and followed up to ensure effective implementation and effective improvement of safety and reliability.
- OEF information is used throughout the plant to effectively improve safety and reliability.

- OEF information is analysed and trended, and the results are used to improve safety and reliability.
- Assessments and indicators are effectively used to review and monitor facility's performance and the effectiveness of the OEF programme.

The review of an OEF programme is a cross-functional process. Therefore, any input from the reviewers of other review areas is beneficial to support the review of the OEF programme.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 2 [4]; GS-G-3.1 [6]; SSG-25 [16]; SSG-28 [8]; SSG-50 [23]; SSG-72 [10]; SSG-75 [12].

Key Requirements

> "Individuals in the organization, from senior managers downwards, shall foster a strong safety culture. The management system and leadership for safety shall be such as to foster and sustain a strong safety culture" (GSR Part 2 Requirement 12) [4].
>
> "The effectiveness of the management system shall be measured, assessed and improved to enhance safety performance, including minimizing the occurrence of problems relating to safety" (GSR Part 2 Requirement 13) [4].
>
> "The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1) [2].
>
> "The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons" (SSR-2/2 (Rev.1) Requirement 7) [2].
>
> "Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources" (SSR-2/2 (Rev.1) Requirement 12) [2].
>
> "The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24) [2].

6.7. RADIATION PROTECTION

The radiation protection programme established and implemented by the operating organization at a nuclear installation should ensure that in all operational states, doses due to exposure to ionizing radiation in the plant or due to any planned releases of radioactive material from the plant are kept below prescribed limits and are as low as reasonably achievable (ALARA). The radiation protection controls during operation of the installation, including the management of radioactive effluents and waste arising from the plant, should be directed not only at protecting workers and members of the public from radiation exposure, but also at preventing or reducing potential exposures and mitigating their potential consequences.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 3 [29]; GSG-7 [19]; GS-G-3.1 [6]; SSG-3 [15]; SSG-25 [16]; SSG-28 [8]; SSG-40 [21]; SSG-48 [22]; SSG-50 [23]; SSG-71 [9]; SSG-72 [10]; SSG-73 [18]; SSG-74 [11]; SSG-75 [12]; RS-G-1.8 [30].

Key Requirements

"Parties with responsibilities for protection and safety shall ensure that the principles of radiation protection are applied for all exposure situations" (GSR Part 3 Requirement 1) [29].

"The person or organization responsible for facilities and activities that give rise to radiation risks shall have the prime responsibility for protection and safety. Other parties shall have specified responsibilities for protection and safety" (GSR Part 3 Requirement 4) [29].

"The principal parties shall ensure that protection and safety are effectively integrated into the overall management system of the organizations for which they are responsible" (GSR Part 3 Requirement 5) [29].

"Registrants and licensees shall be responsible for protection and safety in planned exposure situations" (GSR Part 3 Requirement 9) [29].

"Registrants and licensees and employers shall conduct monitoring to verify compliance with the requirements for protection and safety" (GSR Part 3 Requirement 14) [29].

"Registrants and licensees shall conduct formal investigations of abnormal conditions arising in the operation of facilities or the conduct of activities, and shall disseminate information that is significant for protection and safety" (GSR Part 3 Requirement 16) [29].

"Registrants and licensees shall ensure the safety of radiation generators and radioactive sources" (GSR Part 3 Requirement 17) [29].

"Employers, registrants and licensees shall be responsible for the protection of workers against occupational exposure. Employers, registrants and licensees shall ensure that protection and safety is optimized and that the dose limits for occupational exposure are not exceeded" (GSR Part 3 Requirement 21) [29].

"Workers shall fulfil their obligations and carry out their duties for protection and safety" (GSR Part 3 Requirement 22) [29].

"Employers and registrants and licensees shall cooperate to the extent necessary for compliance by all responsible parties with the requirements for protection and safety" (GSR Part 3 Requirement 23) [29].

"Employers, registrants and licensees shall establish and maintain organizational, procedural and technical arrangements for the designation of controlled areas and supervised areas, for local rules and for monitoring of the workplace, in a radiation protection programme for occupational exposure" (GSR Part 3 Requirement 24) [29].

"Employers, registrants and licensees shall be responsible for making arrangements for assessment and recording of occupational exposure and for workers' health surveillance" (GSR Part 3 Requirement 25) [29].

“Employers, registrants and licensees shall provide workers with adequate information, instruction and training for protection and safety” (GSR Part 3 Requirement 26) [29].

“Employers, registrants and licensees shall make special arrangements for female workers, as necessary, for protection of the embryo or foetus and of breastfed infants. Employers, registrants and licensees shall make special arrangements for protection and safety for persons under 18 years of age who are undergoing training” (GSR Part 3 Requirement 28) [29].

“Relevant parties shall apply the system of protection and safety to protect members of the public against exposure” (GSR Part 3 Requirement 30) [29].

“Relevant parties shall ensure that radioactive waste and discharges of radioactive material to the environment are managed in accordance with the authorization” (GSR Part 3 Requirement 31) [29].

“The regulatory body and relevant parties shall ensure that programmes for source monitoring and environmental monitoring are in place, and that the results from the monitoring are recorded and are made available” (GSR Part 3 Requirement 32) [29].

“The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant” (SSR-2/2 (Rev.1) Requirement 1) [2].

“The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented” (SSR-2/2 (Rev.1) Requirement 3) [2].

“The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant” (SSR-2/2 (Rev.1) Requirement 4) [2].

“The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization” (SSR-2/2 (Rev.1) Requirement 9) [2].

“Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant’s operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources” (SSR-2/2 (Rev.1) Requirement 12) [2].

“The operating organization shall establish and maintain a system for the control of records and reports” (SSR-2/2 (Rev.1) Requirement 15) [2].

“The operating organization shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency” (SSR-2/2 (Rev.1) Requirement 18) [2].

“The operating organization shall establish and implement a radiation protection programme” (SSR-2/2 (Rev.1) Requirement 20) [2].

“The operating organization shall establish and implement a programme for the management of radioactive waste” (SSR-2/2 (Rev.1) Requirement 21) [2].

“The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented” (SSR-2/2 (Rev.1) Requirement 31) [2].

6.8. CHEMISTRY

Chemistry includes the chemical treatment to maintain the integrity of the barriers retaining radioactivity, including fuel cladding and the primary circuit. Chemistry activities have a direct impact in limiting all kinds of corrosion processes causing either a weakening or direct breaches of safety barriers, so as to prevent failures which could occur during a transient.

In addition, chemical treatment includes consideration of its effects on the out-of-core radiation fields that in turn influence radiation doses to which workers are exposed, as well as the external impact in case of a severe accident. For the purpose of these guidelines, plant radiochemistry is included in the chemistry considerations.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 2 [4]; GSR Part 3 [29]; GSR Part 4 (Rev.1) [5]; GSR Part 7 [31]; SSG-3 [15]; SSG-13 [32]; SSG-28 [8]; SSG-48 [22]; SSG-61 [28]; SSG-70 [17]; SSG-71 [9]; SSG-74 [11]; SSG-76 [12].

Key Requirements

> "The registrant or licensee — starting with the senior management — shall ensure that the fundamental safety objective of protecting people and the environment from harmful effects of ionizing radiation is achieved" (GSR Part 2 Requirement 1) [4].
>
> "Managers shall demonstrate leadership for safety and commitment to safety" (GSR Part 2 Requirement 2) [4].
>
> "Senior management shall ensure that appropriate interaction with interested parties takes place" (GSR Part 2 Requirement 5) [4].
>
> "The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, social and economic elements, so that safety is not compromised" (GSR Part 2 Requirement 6) [4].
>
> "The management system shall be documented. The documentation of the management system shall be controlled, usable, readable, clearly identified and readily available at the point of use" (GSR Part 2 Requirement 8) [4].
>
> "Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them" (GSR Part 2 Requirement 9) [4].
>
> "Processes and activities shall be developed and shall be effectively managed to achieve the organization's goals without compromising safety" (GSR Part 2 Requirement 10) [4].
>
> "The organization shall put in place arrangements with vendors, contractors and suppliers for specifying, monitoring and managing the supply to it of items, products and services that may influence safety" (GSR Part 2 Requirement 11) [4].
>
> "The effectiveness of the management system shall be measured, assessed and improved to enhance safety performance, including minimizing the occurrence of problems relating to safety" (GSR Part 2 Requirement 13) [4].

“Relevant parties shall ensure that radioactive waste and discharges of radioactive material to the environment are managed in accordance with the authorization” (GSR Part 3 Requirement 31) [29].

“It shall be determined in the safety assessment whether a facility or activity uses, to the extent practicable, structures, systems and components of robust and proven design” (GSR Part 4 (Rev.1) Requirement 10) [5].

“The government shall ensure that arrangements are in place to assess emergency conditions and to take urgent protective actions and other response actions effectively in a nuclear or radiological emergency” (GSR Part 7 Requirement 9) [31].

“The government shall ensure that overall organization for preparedness and response for a nuclear or radiological emergency is clearly specified and staffed with sufficient personnel who are qualified and are assessed for their fitness for their intended duties” (GSR Part 7 Requirement 21) [31].

“The government shall ensure that personnel relevant for emergency response shall take part in regular training, drills and exercises to ensure that they are able to perform their assigned response functions effectively in a nuclear or radiological emergency” (GSR Part 7 Requirement 25) [31].

“The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant” (SSR-2/2 (Rev.1) Requirement 1) [2].

“The operating organization shall ensure that the plant is operated in accordance with the set of operational limits and conditions” (SSR-2/2 (Rev.1) Requirement 6) [2].

“The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons” (SSR-2/2 (Rev.1) Requirement 7) [2].

“The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable” (SSR-2/2 (Rev.1) Requirement 8) [2].

“The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization” (SSR-2/2 (Rev.1) Requirement 9) [2].

“The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation” (SSR-2/2 (Rev.1) Requirement 10) [2].

“The operating organization shall establish and implement a programme to manage modifications” (SSR-2/2 (Rev.1) Requirement 11) [2].

“Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant’s operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources” (SSR-2/2 (Rev.1) Requirement 12) [2].

"The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant" (SSR-2/2 (Rev.1) Requirement 14) [2].

"The operating organization shall establish and maintain a system for the control of records and reports" (SSR-2/2 (Rev.1) Requirement 15) [2].

"The operating organization shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency" (SSR-2/2 (Rev.1) Requirement 18) [2].

"The operating organization shall establish and implement a radiation protection programme" (SSR-2/2 (Rev.1) Requirement 20) [2].

"The operating organization shall establish and implement a programme for the management of radioactive waste" (SSR-2/2 (Rev.1) Requirement 21) [2].

"The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24) [2].

"Operating procedures shall be developed that apply comprehensively (for the reactor and its associated facilities) for normal operation, anticipated operational occurrences and accident conditions, in accordance with the policy of the operating organization and the requirements of the regulatory body" (SSR-2/2 (Rev.1) Requirement 26) [2].

"The operating organization shall develop and implement programmes to maintain a high standard of material condition, housekeeping and cleanliness in all working areas" (SSR-2/2 (Rev.1) Requirement 28) [2].

"The operating organization shall establish and implement a programme to provide the necessary support for chemistry and radiochemistry" (SSR-2/2 (Rev.1) Requirement 29) [2].

"The operating organization shall be responsible and shall make arrangements for all activities associated with core management and with on-site fuel handling" (SSR-2/2 (Rev.1) Requirement 30) [2].

"The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented" (SSR-2/2 (Rev.1) Requirement 31) [2].

6.9. EMERGENCY PREPAREDNESS AND RESPONSE

Emergency preparedness is the capability to take actions that will effectively mitigate the consequences of an emergency threatening human life, health, property and the environment. The goal of emergency preparedness is to ensure that an adequate capability is in place for a timely, managed, controlled, coordinated and effective response to an emergency at operator, local, regional, national and, as appropriate, international level. Emergency response is the performance of those actions. The goals of emergency response[8] can only be achieved by having sound emergency preparedness in place as part of the overall infrastructure for protection and safety.

[8] Defined in para. 3.2 of GSR Part 7 [31].

This section refers to the on-site emergency arrangements[9] of the nuclear facility that is the subject of the review. Off-site emergency preparedness and response arrangements are not within the scope of this assessment, except for the interface between the operating organization and the off-site emergency response authorities. A further off-site review may be performed on a case by case basis, depending on the scope defined in the request for an OSART review; however, off-site reviews normally fall within the scope of an Emergency Preparedness Review Service (EPREV) mission that can be requested from the IAEA as well.

The requirements of GSR Part 7, which constitute the basis for the key requirements below, are addressed for the most part to the government. In the present context, they need to be interpreted in terms of the key requirements, and within the scope of the operating organization. The operating organization should establish and maintain arrangements for on-site preparedness and response for a nuclear or radiological emergency for facilities or activities under its responsibility, in accordance with the applicable requirements.

IAEA Basis

SSR-2/2 (Rev.1) [2]; SF-1 [3]; GSR Part 2 [4]; GSR Part 3 [29]; GSR Part 4 (Rev.1) [5]; GSR Part 7 [31]; GSG-2 [33]; GSG-7 [19]; GSG-11 [34]; GS-G-2.1 [35]; SSG-3 [15]; SSG-4 [36]; SSG-25 [16]; SSG-28 [8]; SSG-54 [37]; SSG-61 [28]; SSG-72 [10]; SSG-75 [12]: SSG-76 [13].

Key Requirements

> "Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them" (GSR Part 2 Requirement 9) [4].
>
> "The government shall ensure that an integrated and coordinated emergency management system is established and maintained" (GSR Part 3 Requirement 43) [29].
>
> "The government shall ensure that protection strategies are developed, justified and optimized at the planning stage, and that emergency response is undertaken by their timely implementation" (GSR Part 3 Requirement 44) [29].
>
> "The government shall establish a programme for managing, controlling and recording the doses received in an emergency by emergency workers" (GSR Part 3 Requirement 45) [29].
>
> "An assessment of the site characteristics relating to the safety of the facility or activity shall be carried out" (GSR Part 4 Requirement 8) [5].
>
> "The safety assessment shall be periodically reviewed and updated" (GSR Part 4 Requirement 24) [5].
>
> "The government shall make provisions to ensure that roles and responsibilities for preparedness and response for a nuclear or radiological emergency are clearly specified and assigned. The operating organization shall establish and maintain arrangements for on-site preparedness and response for a nuclear or radiological emergency for facilities or activities under its responsibility, in accordance with the applicable requirements. The operating organization shall

[9] The integrated set of infrastructural elements necessary to provide the capability for performing a specified function or task required in response to a nuclear or radiological emergency. These elements may include authorities and responsibilities, organization, coordination, personnel, plans, procedures, facilities, equipment or training. [GSR Part 7].

demonstrate that and shall provide the regulatory body with an assurance that, emergency arrangements are in place for an effective response on the site to a nuclear or radiological emergency, in relation to the facility or the activity under its responsibility" (GSR Part 7 Requirement 2) [31].

"The government shall ensure that a hazard assessment is performed to provide a basis for a graded approach in preparedness and response for a nuclear or radiological emergency" (GSR Part 7 Requirement 4) [31].

"The government shall ensure that protection strategies are developed, justified and optimized at the preparedness stage for taking protective actions and other response actions effectively in a nuclear or radiological emergency" (GSR Part 7 Requirement 5) [31].

"The government shall ensure that arrangements are in place for emergency response operations to be appropriately managed" (GSR Part 7 Requirement 6) [31].

"The government shall ensure that arrangements are in place for the prompt identification and notification of a nuclear or radiological emergency, and for the activation of an emergency response" (GSR Part 7 Requirement 7) [31].

"The government shall ensure that arrangements are in place for taking mitigatory actions in a nuclear or radiological emergency" (GSR Part 7 Requirement 8) [31].

"The government shall ensure that arrangements are in place to assess emergency conditions and to take urgent protective actions and other response actions effectively in a nuclear or radiological emergency" (GSR Part 7 Requirement 9) [31].

"The government shall ensure that arrangements are in place to provide members of the public who are affected or are potentially affected by a nuclear or radiological emergency with information that is necessary for their protection, to warn them promptly and to instruct them on actions to be taken" (GSR Part 7 Requirement 10) [31].

"The government shall ensure that arrangements are in place to protect emergency workers and to protect helpers in an emergency" (GSR Part 7 Requirement 11) [31].

"The government shall ensure that arrangements are in place for the provision of appropriate medical screening and triage, medical treatment, and longer-term medical actions for those people who could be affected in a nuclear or radiological emergency" (GSR Part 7 Requirement 12) [31].

"The government shall ensure that arrangements are in place for communication with the public throughout a nuclear or radiological emergency" (GSR Part 7 Requirement 13) [31].

"The government shall ensure that radioactive waste is managed safely and effectively in a nuclear or radiological emergency" (GSR Part 7 Requirement 15) [31].

"The government shall ensure that arrangements are in place for mitigation of non-radiological consequences of a nuclear or radiological emergency and of an emergency response" (GSR Part 7 Requirement 16) [31].

"The government shall ensure that arrangements are in place and are implemented for the termination of a nuclear or radiological emergency" (GSR Part 7 Requirement 18) [31].

“The government shall ensure that any nuclear or radiological emergency and corresponding emergency response are analysed in order to identify actions to be taken to prevent other emergencies and to improve emergency arrangements” (GSR Part 7 Requirement 19) [31].

“The government shall ensure that authorities for preparedness and response for a nuclear or radiological emergency are clearly established” (GSR Part 7 Requirement 20) [31].

“The government shall ensure that the overall organization for emergency preparedness and response is clearly specified and staffed with sufficient personnel who are qualified and fit for their intended duty” (GSR Part 7 Requirement 21) [31].

“The government shall ensure that arrangements are in place for the coordination of emergency preparedness and response between the operating organization and local, regional and national authorities, and, where appropriate, at international level” (GSR Part 7 Requirement 22) [31].

“The government shall ensure that plans and procedures necessary for effective emergency response are established” (GSR Part 7, Requirement 23) [31].

“The government shall ensure that adequate logistical support and facilities are provided to enable emergency response functions to be performed effectively” (GSR Part 7 Requirement 24) [31].

“The government shall ensure that personnel relevant for emergency response shall take part in regular training, drills and exercises to ensure that they are able to perform their assigned response functions effectively in a nuclear or radiological emergency” (GSR Part 7 Requirement 25) [31].

“The government shall ensure that a programme is established within integrated management systems to ensure the availability and reliability of all supplies, equipment, communication systems and facilities, plans, procedures and other arrangements necessary for effective response in a nuclear or radiological emergency” (GSR Part 7 Requirement 26) [31].

“The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant” (SSR-2/2 (Rev.1) Requirement 1) [2].

“The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented” (SSR-2/2 (Rev.1) Requirement 3) [2].

“The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant” (SSR-2/2 (Rev.1) Requirement 4) [2].

“The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization” (SSR-2/2 (Rev.1) Requirement 9) [2].

“The operating organization shall establish and implement a programme to manage modifications” (SSR-2/2 (Rev.1) Requirement 11) [2].

“Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant’s operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources” (SSR-2/2 (Rev.1) Requirement 12) [2].

"The operating organization shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency" (SSR-2/2 (Rev.1) Requirement 18) [2].

"The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24) [2].

6.10. ACCIDENT MANAGEMENT

Consideration of accidents more severe than the design basis accidents at nuclear installations is an essential component of the defence in depth approach used in ensuring nuclear safety. The probability of occurrence of such accidents is very low but such an accident may lead to significant radiological consequences. The objectives of accident management are to prevent accidents that can lead to fuel damage, and to terminate the progress of fuel damage once it has started, maintain the integrity of the containment as long as possible, minimize releases of radioactive material, and achieve a long term stable state. Therefore, accident management procedures and guidelines that take into account representative and dominant severe accident scenarios, and specify the measures to mitigate the consequences of accidents that exceed the design limits, are an integral part of nuclear safety. A training programme that includes the periodic confirmation of the competence of personnel involved in severe accident management is also expected. A further review on the design and the safety assessment against the severe accident may be done on a case by case basis, depending on the scope defined in the request for an OSART review; however, comprehensive reviews, including the review for the process of development, verification and validation of accident management programmes and design of safety features for the accident management, normally fall within the scope of a Technical Safety Review of Accident Management (TSR-AM) peer review service that can be requested from the IAEA.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 4 (Rev.1) [5]; GSR Part 7 [31]; SSR-2/1 (Rev.1) [24]; GSG-2 [33]; GS-G-2.1 [35]; SSG-3 [15]; SSG-4 [36]; SSG-25 [16]; SSG-28 [8]; SSG-54 [37]; SSG-61 [28]; SSG-71 [9]; SSG-75 [12]; SSG-76 [13].

Key Requirements

"The primary purposes of the safety assessment shall be to determine whether an adequate level of safety has been achieved for a facility or activity and whether the basic safety objectives and safety criteria established by the designer, the operating organization and the regulatory body, in compliance with the requirements for protection and safety as established in Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, have been fulfilled" (GSR Part 4 (Rev.1) Requirement 4) [5].

"The performance of a facility or activity in all operational states and, as necessary, in the post-operational phase shall be assessed in the safety analysis" (GSR Part 4 (Rev.1) Requirement 14) [5].

"Data on operational safety performance shall be collected and assessed" (GSR Part 4 (Rev.1) Requirement 19) [5].

"The safety assessment shall be periodically reviewed and updated" (GSR Part 4 (Rev.1) Requirement 24) [5].

“The government shall ensure that arrangements are in place for taking mitigatory actions in a nuclear or radiological emergency” (GSR Part 7 Requirement 8) [31].

“The reliability of items important to safety shall be commensurate with their safety significance” (SSR-2/1 (Rev.1) Requirement 23) [24].

“The single failure criterion shall be applied to each safety group incorporated in the plant design” (SSR-2/1 (Rev.1) Requirement 25) [24].

“The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant” (SSR-2/2 (Rev.1) Requirement 1) [2].

“The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant” (SSR-2/2 (Rev.1) Requirement 4) [2].

“The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons” (SSR-2/2 (Rev.1) Requirement 7) [2].

“The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization” (SSR-2/2 (Rev.1) Requirement 9) [2].

“The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation” (SSR-2/2 (Rev.1) Requirement 10) [2].

“The operating organization shall establish and implement a programme to manage modifications” (SSR-2/2 (Rev.1) Requirement 11) [2].

“Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant’s operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources” (SSR-2/2 (Rev.1) Requirement 12) [2].

“The operating organization shall ensure that a systematic assessment is carried out to provide reliable confirmation that safety related items are capable of the required performance for all operational states and for accident conditions” (SSR-2/2 (Rev.1) Requirement 13) [2].

“The operating organization shall prepare an emergency plan for preparedness for, and response to, a nuclear or radiological emergency” (SSR-2/2 (Rev.1) Requirement 18) [2].

“The operating organization shall establish, and shall periodically review and as necessary revise, an accident management programme” (SSR-2/2 (Rev.1) Requirement 19) [2].

“The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide” (SSR-2/2 (Rev.1) Requirement 24) [2].

“Operating procedures shall be developed that apply comprehensively (for the reactor and its associated facilities) for normal operation, anticipated operational occurrences and accident conditions, in accordance with the policy of the operating organization and the requirements of the regulatory body” (SSR-2/2 (Rev.1) Requirement 26) [2].

"The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented" (SSR-2/2 (Rev.1) Requirement 31) [2].

6.11. LONG TERM OPERATION

The long term operation (LTO) review assesses strategy and key elements for LTO of nuclear power plants, including implementing appropriate activities to ensure that plant safety will be maintained during the LTO period.

Ageing management of nuclear power plants is an important activity that should be considered in conjunction with the decision to pursue LTO. Effective ageing management programmes are key elements in the safe and reliable operation of nuclear power plants, both during the time frame originally planned for operation and for the period of LTO. Although the LTO review area of an OSART can be conducted at any time during the operational lifetime of the nuclear power plant, it is nonetheless an important part of the OSART review for plants planning to extend their operational life. When LTO is not part of the OSART mission, ageing management is covered by the review in technical support (TS) area. For a deeper review of the LTO area, the IAEA provides a SALTO (Safety Aspects of Long Term Operation) peer review service, which is a comprehensive safety review focused on activities for safe LTO of nuclear power plants. The SALTO Peer Review Guidelines are used as guidance for the SALTO peer review service.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 2 [4]; SSR-2/1 (Rev.1) [24]; GS-G-3.1 [6]; SSG-25 [16]; SSG-48 [22]; SSG-61 [28]; NS-G-2.13 [38].

Key Requirements

"The management system shall integrate its elements, including safety, health, environmental, security, quality, human-and-organizational-factor, social and economic elements, so that safety is not compromised" (GSR Part 2 Requirement 6) [4].

"Senior management shall determine the competences and resources necessary to carry out the activities of the organization safely and shall provide them" (GSR Part 2 Requirement 9) [4].

"A qualification programme for items important to safety shall be implemented to verify that items important to safety at a nuclear installation are capable of performing their intended functions when necessary, and in the prevailing environmental conditions, throughout their design life, with due account taken of plant conditions during maintenance and testing" (SSR-2/1 (Rev.1) Requirement 30) [24].

"The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1) [2].

"The structure of the operating organization and the functions, roles and responsibilities of its personnel shall be established and documented" (SSR-2/2 (Rev.1) Requirement 3) [2].

"The operating organization shall be staffed with competent managers and sufficient qualified personnel for the safe operation of the plant" (SSR-2/2 (Rev.1) Requirement 4) [2].

"The operating organization shall establish and implement a system for plant configuration

management to ensure consistency between design requirements, physical configuration and plant documentation" (SSR-2/2 (Rev.1) Requirement 10) [2].

"Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources" (SSR-2/2 (Rev.1) Requirement 12) [2].

"The operating organization shall ensure that a systematic assessment is carried out to provide reliable confirmation that safety related items are capable of the required performance for all operational states and for accident conditions" (SSR-2/2 (Rev.1) Requirement 13) [2].

"The operating organization shall ensure that an effective ageing management programme is implemented to ensure that required safety functions of systems, structures and components are fulfilled over the entire operating lifetime of the plant" (SSR-2/2 (Rev.1) Requirement 14).

"The operating organization shall establish and maintain a system for the control of records and reports" (SSR-2/2 (Rev.1) Requirement 15) [2].

"Where applicable, the operating organization shall establish and implement a comprehensive programme for ensuring the long term safe operation of the plant beyond a time-frame established in the licence conditions, design limits, safety standards and/or regulations" (SSR-2/2 (Rev.1) Requirement 16) [2].

"The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24) [2].

6.12. COMMISSIONING

Commissioning is an essential process for the subsequent safe operation of a nuclear installation and should be carefully developed, planned, executed and regulated. The commissioning process should be considered as a progressive transition from the construction to the operation of the plant.

Commissioning has the objective of demonstrating that the nuclear installation as constructed, meets the design requirements and the safety requirements as specified in the safety analysis report and in the licence conditions. For the achievement of this objective and to ensure safe and reliable operation of the nuclear installation in the future, the commissioning process should include activities which meet the following purposes:

- To verify that SSCs fulfil the design safety objectives through the corresponding acceptance criteria;
- To collect baseline data for equipment and systems for future reference;
- To validate those operating procedures and surveillance procedures for which commissioning tests provide representative activities and conditions and to validate by trial use, to the extent practicable, that the facility's operating procedures, surveillance procedures and emergency procedures are adequate;
- To familiarize the operating, maintenance and technical staff with the operation of the nuclear installation.

In order to do this, good coordination and communication should be established among all participants in the commissioning process (designers, construction group, licence holder, regulators, manufacturers, commissioning groups and operating groups) and pertinent decisions should be communicated to all parties.

The initial fuel loading into the reactor core is one of the key nuclear safety milestones in the commissioning process. Therefore, it is imperative that all the required prerequisites are satisfied and the relevant acceptance criteria met before the commencement of the initial fuel loading.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GS-G-3.1 [6]; SSG-12 [39]; SSG-28 [8].

Key Requirements

> "The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1) [2].
>
> "The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons" (SSR-2/2 (Rev.1) Requirement 7) [2].
>
> "The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8) [2].
>
> "The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation" (SSR-2/2 (Rev.1) Requirement 10) [2].
>
> "The operating organization shall establish and implement a programme to manage modifications" (SSR-2/2 (Rev.1) Requirement 11) [2].
>
> "The operating organization shall establish an operating experience programme to learn from events at the plant and events in the nuclear industry and other industries worldwide" (SSR-2/2 (Rev.1) Requirement 24) [2].
>
> "The operating organization shall ensure that a commissioning programme for the plant is established and implemented" (SSR-2/2 (Rev.1) Requirement 25) [2].

6.13. TRANSITIONAL PERIOD FROM OPERATION TO DECOMMISSIONING

The transitional period is a specific stage in the lifetime of any nuclear power plant when the plant is still in the operational phase but is preparing for the decommissioning process. Effective planning of the transitional period is very important for safe and timely decommissioning.

The duration of the transitional period will vary depending upon the circumstances surrounding each nuclear installation — the key point is that safety should be maintained during the transitional period. As the full range of operational activities should be included in an OSART mission, it is important to also cover this period.

The transitional period starts when the public announcement of the final shutdown date is made and continues until all nuclear fuel has been permanently removed from both the reactor core and spent fuel storage pool.

Many changes to the management system, staff responsibilities and plant configuration could be made during the transitional period. A significant number of employees (including contractors), possibly with minimal nuclear experience, may be involved in transitional activities. The policy for the management of human resources should focus on:

- Motivation of site personnel for the new tasks and objectives;
- Adaptation of competences for specific decommissioning activities;
- Retention of the necessary pool of experienced site personnel for the planned activities;
- Amendment of the policy for the management of human resources to mitigate the possible negative consequences of downsizing.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 6 [40]; GS-G-3.5 [7]; SSG-13 [32]; SSG-25 [16]; SSG-47 [41]; SSG-61 [28]; SSG-70 [17]; SSG-71 [9]; SSG-74 [11]; SSG-76 [13]; SSG-77 [14].

Key Requirements

> "Exposure during decommissioning shall be considered to be a planned exposure situation, and the relevant requirements of the Basic Safety Standards shall be applied accordingly during decommissioning" (GSR Part 6 Requirement 1) [40].
>
> "Safety shall be assessed for all facilities for which decommissioning is planned and for all facilities undergoing decommissioning" (GSR Part 6 Requirement 3) [40].
>
> "The licensee shall plan for decommissioning and shall conduct the decommissioning actions in compliance with both the authorization for decommissioning and requirements derived from the national legal and regulatory framework. The licensee shall be responsible for all aspects of safety, radiation protection and protection of the environment during decommissioning" (GSR Part 6 Requirement 6) [40].
>
> "The licensee shall ensure that its integrated management system covers all aspects of decommissioning" (GSR Part 6 Requirement 7) [40].
>
> "The licensee shall select a decommissioning strategy that will form the basis for planning the decommissioning. The strategy shall be consistent with the national policy on the management of radioactive waste" (GSR Part 6 Requirement 8) [40].
>
> "Responsibilities in respect of financial provisions for decommissioning shall be set out in national legislation. These provisions shall include establishing a mechanism to provide adequate financial resources for ensuring safe decommissioning and to ensure that they are available when necessary" (GSR Part 6 Requirement 9) [40].
>
> "The licensee shall prepare a decommissioning plan and shall maintain it throughout the lifetime of the facility, in accordance with the requirements of the regulatory body, in order to show that decommissioning can be accomplished safely to meet the defined end state" (GSR Part 6 Requirement 10) [40].

"Prior to execution of decommissioning actions, a final decommissioning plan shall be prepared and shall be submitted to the regulatory body for approval" (GSR Part 6 Requirement 11) [40].

"The licensee shall implement the final decommissioning plan, including management of radioactive waste, in compliance with national regulations" (GSR Part 6 Requirement 12) [40].

"Radioactive waste shall be managed for all waste streams in decommissioning" (GSR Part 6 Requirement 14) [40].

"The operating organization shall ensure that all activities that may affect safety are performed by suitably qualified and competent persons" (SSR-2/2 (Rev.1) Requirement 7) [2].

"The operating organization shall establish and implement a system for plant configuration management to ensure consistency between design requirements, physical configuration and plant documentation" (SSR-2/2 (Rev.1) Requirement 10) [2].

"The operating organization shall establish and implement a programme to manage modifications" (SSR-2/2 (Rev.1) Requirement 11) [2].

"The operating organization shall establish and maintain a system for the control of records and reports" (SSR-2/2 (Rev.1) Requirement 15) [2].

"The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented" (SSR-2/2 (Rev.1) Requirement 31) [2].

"The operating organization shall prepare a decommissioning plan and shall maintain it throughout the lifetime of the plant, unless otherwise approved by the regulatory body, to demonstrate that decommissioning can be accomplished safely and in such a way as to meet the specified end state" (SSR-2/2 (Rev.1) Requirement 33) [2].

6.14. USE OF PROBABILISTIC SAFETY ASSESSMENT FOR PLANT OPERATIONAL SAFETY IMPROVEMENTS

Probabilistic safety assessment (PSA) has been demonstrated to provide important safety insights, in addition to those provided by deterministic analysis, and is widely recognized as a comprehensive, structured approach to identifying accident scenarios and deriving numerical estimates of risks related to operation and associated vulnerabilities. Based on its results, the design basis for SSCs rated as important to safety can be established and confirmed. This serves to ensure full confidence in the fact that the design will comply with the general safety objectives. As part of an OSART review, mainly the following PSA applications are of interest:

- PSA applications in connection with design evaluation and plant modifications;
- PSA applications in connection with plant operation;
- PSA applications in connection with risk-informed operational limits and conditions.

Where the results of the PSA are to be used in support of the decision making process, a formal organizational framework and technical support for doing so should be established. The details of the decision making process will depend on the purpose of the PSA application, the nature of the decision to be made, and the PSA results to be used. A further comprehensive review including the aspects of

the design and the safety assessment is provided by IAEA's Technical Safety Review (TSR-PSA), depending on the request.

IAEA Basis

SSR-2/2 (Rev.1) [2]; GSR Part 4 (Rev.1) [5]; SSG-3 [15]; SSG-4 [36]; SSG-25 [16]; SSG-71 [9]; SSG-72 [10]; SSG-74 [11]; SSG-75 [12].

Key Requirements

"The results and findings of the safety assessment shall be documented" (GSR Part 4 (Rev.1) Requirement 20) [5].

"The safety assessment shall be periodically reviewed and updated" (GSR Part 4 (Rev.1) Requirement 24) [5].

"The operating organization shall have the prime responsibility for safety in the operation of a nuclear power plant" (SSR-2/2 (Rev.1) Requirement 1) [2].

"The operating organization shall ensure that safety related activities are adequately analysed and controlled to ensure that the risks associated with harmful effects of ionizing radiation are kept as low as reasonably achievable" (SSR-2/2 (Rev.1) Requirement 8) [2].

"The operating organization shall establish a system for continuous monitoring and periodic review of the safety of the plant and of the performance of the operating organization" (SSR-2/2 (Rev.1) Requirement 9) [2].

"The operating organization shall establish and implement a programme to manage modifications" (SSR-2/2 (Rev.1) Requirement 11) [2].

"Systematic safety assessments of the plant, in accordance with the regulatory requirements, shall be performed by the operating organization throughout the plant's operating lifetime, with due account taken of operating experience and significant new safety related information from all relevant sources" (SSR-2/2 (Rev.1) Requirement 12) [2].

"The operating organization shall ensure that effective programmes for maintenance, testing, surveillance and inspection are established and implemented" (SSR-2/2 (Rev.1) Requirement 31) [2].

REFERENCES

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Corporate OSART Guidelines, IAEA Service Series No. 47, IAEA, Vienna (2022).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Operation and Commissioning, IAEA Safety Standards Series No. SSR-2/2 (Rev.1), IAEA, Vienna (2016).

[3] EUROPEAN ATOMIC ENERGY COMMUNITY, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Fundamental Safety Principles, IAEA Safety Standards Series No. SF-1, IAEA, Vienna (2006).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, Leadership and Management for Safety, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Facilities and Activities, IAEA Safety Standards Series No. GSR Part 4 (Rev.1), IAEA, Vienna (2016).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Application of the Management System for Facilities and Activities, IAEA Safety Standards Series No. GS-G-3.1, IAEA, Vienna (2006).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Nuclear Installations, IAEA Safety Standards Series No. GS-G-3.5, IAEA, Vienna (2009).

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Commissioning for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-28, IAEA, Vienna (2014).

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Modifications to Nuclear Power Plants, IAEA Safety Standards Series No. SSG-71, IAEA, Vienna (2022).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, The Operating Organization for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-72, IAEA, Vienna (2022).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Maintenance, Testing, Surveillance and Inspection in Nuclear Power Plants, IAEA Safety Standards Series No. SSG-74, IAEA, Vienna (2022).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Recruitment, Qualification and Training of Personnel for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-75, IAEA, Vienna (2022).

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, Conduct of Operations at Nuclear Power Plants, IAEA Safety Standards Series No. SSG-76, IAEA, Vienna (2022).

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Protection against Internal and External Hazards in the Operation of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-77, IAEA, Vienna (2022).

[15] INTERNATIONAL ATOMIC ENERGY AGENCY, Development and Application of Level 1 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-3, IAEA, Vienna (2010).

[16] INTERNATIONAL ATOMIC ENERGY AGENCY, Periodic Safety Review of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-25, IAEA, Vienna (2013).

[17] INTERNATIONAL ATOMIC ENERGY AGENCY, Operational Limits and Conditions and Operating Procedures for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-70, IAEA, Vienna (2022).

[18] INTERNATIONAL ATOMIC ENERGY AGENCY, Core Management and Fuel Handling for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-73, IAEA, Vienna (2022).

[19] INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, Occupational Radiation Protection IAEA Safety Standards Series No. GSG-7, IAEA, Vienna (2018).

[20] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Classification of Structures, Systems and Components in Nuclear Power Plants, IAEA Safety Standards Series No. SSG-30, IAEA, Vienna (2014).

[21] INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste from Nuclear Power Plants and Research Reactors, IAEA Safety Standards Series No. SSG-40, IAEA, Vienna (2016).

[22] INTERNATIONAL ATOMIC ENERGY AGENCY, Aging Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, IAEA Safety Standards Series No. SSG-48, IAEA, Vienna (2018).

[23] INTERNATIONAL ATOMIC ENERGY AGENCY, Operating Experience Feedback for Nuclear Installations, IAEA Safety Standards Series No. SSG-50, IAEA, Vienna (2018).

[24] INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Nuclear Power Plants: Design, IAEA Safety Standards Series No. SSR-2/1 (Rev.1), IAEA, Vienna (2016).

[25] INTERNATIONAL ATOMIC ENERGY AGENCY, Deterministic Safety Analysis for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-2 (Rev.1), IAEA, Vienna (2019).

[26] INTERNATIONAL ATOMIC ENERGY AGENCY, Construction for Nuclear Installations, IAEA Safety Standards Series No. SSG-38, IAEA, Vienna (2015).

[27] INTERNATIONAL ATOMIC ENERGY AGENCY, Design of Instrumentation and Control Systems for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-39, IAEA, Vienna (2016).

[28] INTERNATIONAL ATOMIC ENERGY AGENCY, Format and Content of the Safety Analysis Report for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-61, IAEA, Vienna (2021).

[29] EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and the Safety of Radiation Sources: International Basis Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014).

[30] INTERNATIONAL ATOMIC ENERGY AGENCY, Environmental and Source Monitoring for Purposes of Radiation Protection, IAEA Safety Standards Series No. RS-G-1.8, IAEA, Vienna (2005).

[31] FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, PREPARATORY COMMISSION FOR THE COMPREHENSIVE NUCLEAR-TEST-BAN TREATY ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSR Part 7, IAEA, Vienna (2015).

[32] INTERNATIONAL ATOMIC ENERGY AGENCY, Chemistry Programme for Water Cooled Nuclear Power Plants, IAEA Safety Standards Series No. SSG-13, IAEA, Vienna (2011).

[33] FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011).

[34] FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR OFFICE, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, WORLD METEOROLOGICAL ORGANIZATION, Arrangements for the Termination of A Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-11, IAEA, Vienna (2018).

[35] FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR OFFICE, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH

ORGANIZATION, Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007).

[36] INTERNATIONAL ATOMIC ENERGY AGENCY, Development and Application of Level 2 Probabilistic Safety Assessment for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-4, IAEA, Vienna (2010).

[37] INTERNATIONAL ATOMIC ENERGY AGENCY, Accident Management Programmes for Nuclear Power Plants, IAEA Safety Standards Series No. SSG-54, IAEA, Vienna (2019).

[38] INTERNATIONAL ATOMIC ENERGY AGENCY, Evaluation of Seismic Safety for Existing Nuclear Installations, IAEA Safety Standards Series No. NS-G-2.13, IAEA, Vienna (2009).

[39] INTERNATIONAL ATOMIC ENERGY AGENCY, Licensing Process for Nuclear Installations, IAEA Safety Standards Series No. SSG-12, IAEA, Vienna (2010).

[40] INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities, IAEA Safety Standards Series No. GSR Part 6, IAEA, Vienna (2014).

[41] INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities, IAEA Safety Standards Series No. SSG-47, IAEA, Vienna (2018).

[42] INTERNATIONAL LABOUR OFFICE, Guidelines on occupational safety and health management systems, ILO-OSH-2001, ILO, Geneva (2001).

[43] INTERNATIONAL LABOUR OFFICE, Safety and health in construction, ILO, Geneva (1992).

[44] INTERNATIONAL LABOUR OFFICE, Safety in the use of chemicals at work, ILO, Geneva (1993).

BIBLIOGRAPHY

INTERNATIONAL ATOMIC ENERGY AGENCY

— Developing Safety Culture in Nuclear Activities, Safety Reports Series No. 11, IAEA, Vienna (1998).
— Optimization of Radiation Protection in the Control of Occupational Exposure, Safety Reports Series No. 21, IAEA, Vienna (2002).
— Implementation of Accident Management Programmes in Nuclear Power Plants, Safety Reports Series No. 32, IAEA, Vienna (2004).
— Safety Considerations in the Transition from Operation to Decommissioning of Nuclear Facilities, Safety Reports Series No. 36, IAEA, Vienna (2004).
— Development and Review of Plant Specific Emergency Operating Procedures, Safety Reports Series No. 48, IAEA, Vienna (2006).
— Application of Configuration Management in Nuclear Power Plants, Safety Reports Series No. 65, IAEA, Vienna (2010).
— Low Level Event and Near Miss Process for Nuclear Power Plants: Best Practices, Safety Reports Series No. 73, IAEA, Vienna (2012).
— Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL), Safety Reports Series No. 82 (Rev.1), IAEA, Vienna (2020).
— Performing Safety Culture Self-assessments, Safety Reports Series No. 83, IAEA, Vienna (2016).

— Effective Corrective Actions to Enhance Operational Safety of Nuclear Installations, IAEA-TECDOC-1458, IAEA, Vienna (2005).
— Trending of Low Level Events and Near Misses to Enhance Safety Performance in Nuclear Power Plants, IAEA-TECDOC-1477, IAEA, Vienna (2005).
— Coolant Chemistry Control and Effects on Fuel Reliability in Pressurized Heavy Water Reactors, IAEA-TECDOC-1942, IAEA, Vienna (2021).

— Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency (Updating IAEA-TECDOC-953), EPR-METHOD-2003, IAEA, Vienna (2003).
— Preparation, Conduct and Evaluation of Exercises to Test Preparedness for a Nuclear or Radiological Emergency, EPR-EXERCISE-2005, IAEA, Vienna (2005).
— Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor, EPR-NPP-PPA-2013, IAEA, Vienna (2013).
— Operations Manual for Incident and Emergency Communication, EPR-IEComm-2019, IAEA, Vienna (2020).

— IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection, 2018 Edition, IAEA, Vienna (2019).

— Guidelines for Peer Review and for Self-Assessment of Operational Safety Performance Improvement Programmes at Nuclear Power Plants (PROSPER Guidelines), IAEA Services Series No. 10 (Rev.1) (in preparation).
— Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants and Research Reactors (SALTO Peer Review Guidelines), 2021 Edition, IAEA Services Series No. 26 (Rev.1), IAEA, Vienna (2021).

— OSART Independent Safety Culture Assessment (ISCA) Guidelines, IAEA Services Series No. 32, IAEA, Vienna (2016).
— OSART (Except Corporate OSART) Guidelines 2022 Edition, IAEA Services Series No. 12 (Rev.2), IAEA, Vienna (2022).

INTERNATIONAL NUCLEAR SAFETY ADVISORY GROUP

— Safety Culture, INSAG Series No. 4, IAEA, Vienna (1991).
— Defence in Depth in Nuclear Safety, INSAG Series No. 10, IAEA, Vienna (1996).
— Key Practical Issues In Strengthening Safety Culture: INSAG Series No. 15, IAEA, Vienna (2002).
— Managing Change in the Nuclear Industry: The Effects on Safety: INSAG Series No. 18, IAEA, Vienna (2003).
— The Design Integrity of Nuclear Installations Throughout Their Operating Life, INSAG Series No. 19, IAEA, Vienna (2003).
— Improving the International System for Operating Experience Feedback, INSAG Series No. 23, IAEA, Vienna (2008).
— The Interface Between Safety and Security at Nuclear Power Plants, INSAG Series No. 24, IAEA, Vienna (2010).
— A Framework for an Integrated Risk Informed Decision Making Process, INSAG Series No. 25, IAEA, Vienna (2011).
— Ensuring Robust National Nuclear Safety Systems — Institutional Strength in Depth, INSAG Series No. 27, IAEA, Vienna (2017).

ANNEX I
STANDARD STRUCTURE AND CONTENT OF AN ADVANCE INFORMATION PACKAGE FOR AN IAEA OSART MISSION

The AIP is prepared by the nuclear power plant or closely related organization hosting the OSART mission and is used to convey information relevant to the OSART team members for the preparation of their review.

The package should contain adequate information and data to understand the overall organizational structures and current operating practices. It should also include an overview of the nuclear power plant's approach to operational safety, the key operational features and the organizational setup. While the contents of the package should cover essential plant features, it should also be compact. Many plants subsequently use the AIP for induction training of new employees.

The workload in preparing the package should be minimized. The compilation of information should be based on and/or utilize existing documents such as routinely prepared reports, procedures and training materials. Focus on the content is encouraged, with limited effort spent on editing. The package should be in English (including tables and figures, such as the performance indicators and organizational charts).

To the extent possible, the format of the AIP should follow the same review areas as that of the OSART guidelines.

I–1. ADMINISTRATIVE INFORMATION

- Arrival logistics (airport, hotel, plant);
- Transportation airport–hotel, hotel–plant, plant–hotel, hotel–airport;
- Hotel accommodation information (name, telephone number, website address, internet access);
- Contact points at the plant and list of counterparts (names, e-mail addresses, telephone numbers);
- Site accommodation (site access controls, controlled area access, meeting rooms, OSART offices, clerical and interpreting support, office equipment and lunch arrangements);
- Summary of site-specific radiological, industrial and fire safety rules, and emergency response provisions.

I–2. GENERAL INFORMATION

I–2.1. Description of the nuclear installation

- Overall description of the site and installation, and which units are to be reviewed;
- Brief operating history of the installation;
- Organizational chart of the entire nuclear department and of the nuclear power plant;
- Locations of major plant structures and buildings (schematic map of their layout);
- Performance indicators.

I–2.2. Design information

- Major process and safety systems;
- Key design parameters;
- Unique safety features.

I–2.3. External organizations

Brief description of the main functions, structures and interactions of external organizations liaising with the nuclear installation:

- Host organization's headquarters;
- Industry organizations;
- Regulatory body;
- Main suppliers and subcontractors;
- Contractors supporting plant maintenance.

I–2.4. Self-assessment

- For each review area, a description of how each area expectation is met;
- Specific gaps where performance or programmes do not fully meet the IAEA safety standards;
- For each gap identified, an explanation of what corrective actions are being taken and/or planned to close the gap, including budget commitments, staffing, document preparation, increased or modified training, equipment purchases, etc.

I–3. TECHNICAL INFORMATION

- Outline of operating licence;
- Safety performance indicators;
- Proposal of a detailed review schedule for each area;
- List of abbreviations and acronyms used in the host organization;
- Colour-coded plant system identification and labelling arrangements;
- List of designations of organizational units (e.g. department, division, section, group) and positions (e.g. superintendent, manager, chief, head);
- List, terms of reference and timetables of the most significant regular meetings at the organization.

I–4. INFORMATION ON REVIEW AREAS

I–4.1. Leadership and Management for Safety

- Organization and structure;
- Overall management programme, including a management philosophy;
- Management objectives and expectations, goals and nuclear safety policies;
- Statistics on staff turnover and current age profile;
- Recent plant status report (monthly, quarterly or yearly);
- Brief description of nuclear safety management practices;
- An operating philosophy for procedures and instructions;
- Reviewing bodies (safety committees – internal and external);
- Management system overview, including quality management;
- Brief description of document control system;
- Safety culture and human performance aspects, includes:
    - Safety culture;
    - Leadership for safety;
    - Management for safety;

- Management of human factors;
- Safety related activities;
- Monitoring and assessment of safety performance;
- Learning organization;
- Knowledge management programmes;
- Overall approach to industrial safety.

I–4.2. Training and Qualification

- Organization of training functions;
- Overall plant/organization training programme, including initial and continuing training;
- List of major training procedures;
- Overview of training facilities;
- Qualification requirements for key plant positions;
- General training of employees;
- Training activities planned during the OSART mission.

I–4.3. Operations

- Shift structure and staffing levels;
- Overall distribution of responsibility during normal operation and accident conditions, lines of command and communication;
- Work request authorization, equipment isolation and tagging system, locking systems;
- Control of modifications;
- List of normal operating procedures;
- Brief description of operational limits and conditions;
- System of emergency operating procedures;
- Accident management approach;
- Overall approach to fire protection and prevention.

I–4.4. Maintenance

- Maintenance strategy (including safety classification) and organization;
- Overall programme for corrective and preventive maintenance;
- Evaluation, analysis and trending of maintenance activities;
- Typical outage programme and schedule;
- Overview of maintenance facilities and/or workshops;
- Brief description of in-service inspection programme;
- List of major maintenance procedures;
- Material condition strategy;
- Work authorization programme;
- Spare parts and material storage programme and facilities.

I–4.5. Technical Support

- Technical support organization and structure, including interface with and support of external organizations such as headquarters, international and national organizations, designers, manufacturers and other institutions;
- Outline of the surveillance programme;
- Overall approach to protection against internal and external hazards;
- Plant modification philosophy, with a list of past and planned major modifications;
- Design integrity and configuration control approach;
- Temporary modification review process and current status;
- PSA undertaken;
- Findings of the periodic safety review and current status of the safety analysis report;
- Overview of reactor physics;
- Management of fresh and spent nuclear fuel;
- Overview of computer-based systems important to safety;
- Ageing management programme.

I–4.6. Operating Experience Feedback

- Operating experience organization and management;
- Identification and reporting of internal and external experience;
- Reportable events, including brief description of root cause analysis undertaken over the last three years;
- Screening: thresholds for internal and external operating experience;
- Corrective action programme;
- Trending and review of events, including low-level events and near-misses;
- Investigations: causes, human, organizational, skills, training;
- Effectiveness and indicators of operating experience;
- Communication: use, dissemination and exchange of operating experience.

I–4.7. Radiation Protection

- Radiation protection organization and staffing level;
- Outline of applicable radiation protection regulations;
- Radiation exposure and contamination control policy;
- Radiation protection instrumentation;
- Management of radioactive waste and discharges;
- List of radiation protection procedures;
- Recent radiation protection report data regarding collective and individual dose statistics, contamination events;
- Implementation of the ALARA (as low as reasonably achievable) principles,
- Measures applied in emergency situations.

I–4.8. Chemistry

- Chemistry organization and staffing level;
- List of chemistry procedures;
- Quality control of results of analysis and operational chemicals;
- Overview of chemistry programme, specifications, system of parameter limits, operational history;
- Overview of online monitors and sampling stations;
- Laboratory facilities, equipment and instruments;
- Interlaboratory comparisons;
- Chemistry surveillance and control programme;
- Post-accident sampling system (PASS) operation.

I–4.9. Emergency Preparedness and Response

- Organizational structure of the host organization and the relevant external organization for EPR;
- Hazard assessment and protection strategy;
- EPR documentation hierarchy diagram;
- Outline of plant emergency plan and interfaces with external organizations;
- Plant emergency facilities (on-site and off-site);
- Emergency notification and communication;
- Emergency preparedness;
- Emergency response;
- Intervention levels;
- Emergency training, drills and exercises and feedback.

I–4.10. Accident Management

- Overview of the severe accident management programme;
- Analytical support for severe accident management;
- Development of procedures and guidelines;
- Plant emergency arrangements with respect to severe accident management;
- Lines of responsibility;
- Emergency centres;
- Communications;
- Verification and validation of procedures and guidelines;
- Control of plant configuration;
- Training needs and training performance;
- Severe accident management updating and revisions.

I–4.11. Long Term Operation and Ageing Management

- Plant policy for LTO and ageing management, organization and staffing level;
- Overview of the programme for LTO and ageing management;
- LTO and ageing management related requirements, codes and standards;
- LTO and ageing management programme implementation;
- Safety analysis report;

- Ageing management review;
- Time limited ageing analyses;
- Documentation, database and records;
- Equipment qualification programme;
- Technological obsolescence management;
- Use of periodic safety review.

I–4.12. Commissioning

- Description of the commissioning process;
- Organization and management of the commissioning process;
- Implementation of the commissioning programme;
- List of equipment and systems under operations control;
- Key commissioning milestone dates;
- Description of the non-conformance process and disposition of the non-conformance;
- List of key commissioning meetings and their purposes;
- Control of plant configuration;
- Use of OEF during commissioning.

I–4.13. Transition from Operation to Decommissioning

- Plant policy for transition from operation to decommissioning, organization and staffing level;
- Management policies and activities;
- Conduct of operations;
- Work management and housekeeping;
- Technical support activities for the transition period;
- Special safety assessments and risk analysis;
- Use of operating experience;
- Radiation protection and waste management for the transition period;
- Core management and fuel handling;
- Chemistry;
- Emergency preparedness and response.

I–4.14. Use of PSA for Plant Operational Safety Improvements

- Organization and management;
- PSA project management;
- Development of PSA;
- Use of PSA and related applications;
- Use of periodic safety review and OEF to support PSA applications.

ANNEX II
CODE OF CONDUCT FOR THE OSART TEAM

A. Review gaps to the IAEA safety standards

Thresholds for identifying recommendations and suggestions are based on the most important nuclear safety and personnel safety gaps in the operating organization being reviewed. These gaps may concern current performance and important historical performance of the host organization.

B. Focus on the key interested parties of the OSART mission

Team members have to bear in mind that OSART results will be used by a wide range of interested parties. The key interested parties include the Member State, plant staff, the global nuclear industry, and the IAEA. Improving the safety performance of the host organization is the highest priority when developing recommendations and suggestions.

C. OSART teams are well prepared before arriving on the site

The AIP is reviewed and analysed to the maximum extent possible before the on-site portion of the mission.

D. OSART teams are present at the nuclear installation, amongst both people and equipment, observing important activities

Team members need to be proactive and inquisitive and be present during in-facility activities that are important to nuclear and personnel safety. This may include backshift and weekend observations.

E. Key events and plant performance are thoroughly understood

Team members need to fully understand the host organization's most consequential events and performance gaps. Team members conduct an independent review of information provided by host organization staff.

F. The OSART recommendations and suggestions are based on facts

The team and host organization staff work together to validate facts. It is the team's responsibility to draw objective conclusions from the facts and determine recommendations and suggestions.

G. OSART teams build strong professional relationships with counterparts

Reviewers and team leaders strive to be models in communication and to be models of integrity and professionalism. Reviewers should listen closely to their counterparts and strive to understand their perspectives of plant performance.

H. Strength is with the team, not one individual

Team members strive to fulfil their roles on an OSART mission team and professionally challenge each other's opinions.

I. The OSART team reinforces the integrity, impartiality, and independence of the review process

Team members adhere to the principles of the OSART mission methodology. This includes insisting that host organization staff be open during their interactions with the OSART team and that a normal schedule of work activities be maintained during on-site periods. Team members do not back down on issues if faced with inappropriate counterpart defensiveness. The team members support each other recognizing that the OSART report is a result of a teamwork, and the team member upholds high standards of integrity, impartiality and independence during the review and interactions with the host plant.

ANNEX III
GUIDELINES FOR OBSERVERS IN THE OSART MISSION

III–1. OBJECTIVE OF PARTICIPATION AS OBSERVER

The IAEA's OSART programme provides Member States with advice and assistance in their enhancement of operational safety of nuclear power plants by systematic reviews of operational safety practices. One of the features of the programme is the participation of observers who benefit from participation and training in one or more of the areas covered in a particular OSART mission. Observers are mainly staff working at nuclear power plants, which may host OSART missions in the near future. Participation as observers is particularly encouraged from countries developing their nuclear power programmes and from those countries which would benefit from greater exposure to international practices.

Participation in an OSART mission gives to an observer an opportunity to:

- Obtain an overview of a review of operational safety of a nuclear power plant with respect to international standards;
- Receive an understanding of different factors which contribute to operational safety, such as management and organization; training; human and material resources; management system; policies; programmes, plans; procedures; reporting systems; and culture for safety;
- Broaden an observer's experience and knowledge in his or her own field through reviewing documents, observing activities and listening and participating in discussions with peers from different countries concerning practices in the observer's specific field;
- Obtain information, for any particular topics, on the practices adopted in the various countries represented by the members of the team;
- Take back potential improvements in programmes and practices for consideration by the observer's own country and plant in areas where performance falls short of best international practices;
- Learn review methodology and techniques;
- Obtain information, at first hand, on OSART mission (Note: useful for countries and/or nuclear power plants that are planning to host an OSART mission);
- Make personal contacts with the host staff and team members for further cooperation and information exchange.

III–2. ROLE OF AN OBSERVER IN AN OSART MISSION

- An observer participates in an OSART mission in a certain review area or, as an exception, in more than one area which he or she has indicated in their application to the Agency. At the beginning of the mission final arrangements for participation are agreed with the team leader so that the interests of all observers and experts are met.
- During a mission, an observer takes part in the review of the designated areas mainly by observing, but they are encouraged to assist in the review. However, the responsibility for the conduct of the review, the production of Technical Notes and the presentation of results at the exit meeting lies with the review area expert. (The team leader may ask the observer to continue with the assessment of the review area if the lead expert is incapacitated due to sickness or unavailability, and the observer has the appropriate experience for the review area.)

- To prepare for the mission an observer should read the material provided by the IAEA and the host organization. They should develop a list of items that are of special interest for developing programmes or practices in the observer's plant or country. Before the commencement of the review, the observer should give to the team leader and the corresponding expert their overall objectives for the mission and list of areas of interest.
- The observer's main task is to identify operational practices which might be applicable to his or her own plant or country, and to assess whether they are suitable when taking into account the particularities of their own country such as organization, technological development, reactor technologies, and organizational culture. To achieve this task the observer will be supported primarily by the corresponding expert but also by the rest of the team, if required. In this way, the observer gathers information not just from the power plant being reviewed, but also from the expert they are attached to and other team members.

To maximize his or her participation in an OSART mission, an observer is asked to work systematically throughout the mission. An observer should:

- Take part in the daily review activities of the designated areas mainly by observing and assisting in the review;
- Write a daily summary of topics and items which were reviewed, particularly those of special interest to them, and provide a copy to the team leader, deputy team leader and the expert reviewing the designated areas;
- Write daily notes of the topics reviewed concentrating on the aspects and practices which are different from those applied in his or her own country or plant (e.g. from the point of view of the organization; techniques; allocation of resources; coverage or intensity of programmes; aspects included or level of details in procedures and instructions; and overall attitudes, objectives and culture for safety).
- Include also those aspects of OSART process that might be useful for observers in future OSART missions;
- Compile daily notes into a report. The first draft of the report should be submitted to, and discussed with, the team leader and the expert reviewing the designated areas concerned at the end of the first week. A full two-week report that incorporates information from the first week should be submitted at the end of the second week. Both reports should indicate progress in meeting overall objectives and obtain information on items of special interest;
- Identify good ideas, practices or programmes for possible use in his or her own country;
- Discuss any concerns or problems, should they occur, with the team leader and the expert.

III–3. QUALIFICATION AND EXPERIENCE OF AN OBSERVER

To satisfactorily meet the objectives of participation as observers in the OSART mission, each observer should have relevant experience and qualifications. The following items should be considered when nominating observers:

- Practical experience and sound knowledge of the review area to be observed;
- Knowledge of the plant management aspects, safety culture characteristics and reactor technology of the plant to be reviewed;
- Sufficient level of the English language to be able to follow and contribute to a conversation and to write reports;
- Good communicative skills to be able to interact effectively with the expert in the area and with other team members and plant staff.

GLOSSARY

encouragement. If an item does not have sufficient safety significance to meet the criteria of a 'recommendation' or 'suggestion', but the expert or the team feels that mentioning it is still desirable, the given topic may be described in the text of the report using the phrase 'encouragement' (e.g. the team encouraged the host organization to…).

facts. A fact is something that is known to have happened or to exist, especially something for which proof exists, or about which there is information. A fact is evidence of a deficiency in programmes or performance. Based on the grouping of facts of similar nature, each reviewer develops an issue stated as a fundamental overall problem which can have a safety consequence.

fundamental overall problem. A fundamental overall problem is a generic deficiency in programmes or performance which is supported by multiple, agreed facts, stated in terms that are consistent with the facts, agreed by the team and which can lead to a safety consequence.

good performance. A good performance is a superior objective that has been achieved or a good technique or programme that contributes directly or indirectly to operational safety and sustained good performance, that works well at the nuclear installation. However, it might not be necessary to recommend its adoption by other nuclear installations, because of financial considerations, differences in design or other reasons.

good practice. A good practice is an outstanding and proven programme, activity or equipment in use that contributes directly or indirectly to operational safety and sustained good performance. A good practice is markedly superior to that observed elsewhere, not just the fulfilment of current requirements or expectations. It should be superior enough and have broad enough application to be brought to the attention of other nuclear operating organizations and be worthy of their consideration in the general drive for excellence. A good practice is novel; has a proven benefit; is replicable (it can be used in other organizations); and does not contradict an issue. Normally, good practices are brought to the attention of the team on the initiative of the host organization. An item may not meet all the criteria of a 'good practice', but still be worthy to take note of. In this case it may be referred as a 'good performance' and documented in the text of the report.

issue. An issue is an identified problem or an area of improvement, which has been identified based on the IAEA safety standards. An issue has a safety consequence that justifies the review team making a recommendation or suggestion.

peer review service. An examination or review of commercial, professional or academic efficiency, competence, etc., by experts in the relevant field. An IAEA peer review service is a process designed to facilitate the review of the degree of conformance of selected regulatory and technical elements of the national infrastructure for nuclear safety, with the IAEA safety standards. The review is conducted by a team of experts and coordinated by IAEA staff.

recommendation. A recommendation is advice on what improvements in operational safety should be made in the activity or programme that has been evaluated. It is based on inadequate conformance with the IAEA safety standards and addresses the general concern rather than the symptoms of the identified concern. Recommendations are specific, realistic and designed to result in tangible improvements.

safety consequence. A safety consequence is an adverse effect on safety that could result from deficient programmes or poor performance.

self-identified issue. A self-identified issue is documented by the OSART team in recognition of actions taken to address inadequate conformance with the IAEA safety standards identified in the self-assessment made by the host organization prior to the mission and reported to the OSART team by means of the Advance Information Package. Credit is given for the fact that actions have been taken, including root cause determination, which leads to a high level of confidence that the issue will be resolved within a reasonable time frame. These actions should include all the necessary provisions such as, for example, budget commitments, staffing, document preparation, increased or modified training, or equipment purchases, as necessary.

suggestion. A suggestion is advice on an opportunity for a safety improvement not directly related to inadequate conformance with the IAEA safety standards. It is primarily intended to make performance more effective, to indicate useful expansions to existing programmes and to point out possible superior alternatives to ongoing work.

LIST OF ABBREVIATIONS

AIP	advance information package
EPR	emergency preparedness and response
FOP	fundamental overall problem
LTO	long term operation
OEF	operating experience feedback
OSART	Operational Safety Review Team
PSA	probabilistic safety assessment
SSCs	structures, systems and components
WNOs	working notes outlines

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