OSART MISSION HIGHLIGHTS 2003-2006

Operational Safety Practices in Nuclear Power Plants

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DIVISION OF NUCLEAR INSTALLATION SAFETY

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FOREWORD

The IAEA Operational Safety Review Team (OSART) programme provides advice and assistance to Member States in enhancing the operational safety of nuclear power plants (NPPs). Careful design and high quality of construction are prerequisites for a safe nuclear power plant. However, a plant's safety depends ultimately on the ability and conscientiousness of the operating personnel and on the plant programmes, processes and working methods. An OSART mission reviews a facility's operational performance against IAEA Safety Standards and proven good international practices.

The OSART reviews are available to all countries with nuclear power plants in operation, and also approaching operation, commissioning or in earlier stages of construction (Pre-OSART). Most countries have participated in the programme by hosting one or more OSART missions or by making experts available to participate in missions. Operational safety missions could also be part of the design review missions of nuclear power plants and are known as Safety Review Missions (SRMs). Teams that review only a few specific areas or a specific issue are called Expert missions. Follow-up visits are a standard part of the OSART programme and are conducted between 12 to 18 months following the OSART mission.

This report continues the practice of summarizing mission results so that all the aspects of OSART missions are to be found in one document. It also includes the results of follow-up visits. Attempts have been made in this report to highlight the most significant findings while retaining as much of the vital background information as possible. This report is divided in two main chapters:

Chapter 1 summarizes the most significant observations made during the missions and follow-up visits between 2003 and 2006. Trends are identified and futures evolutions of safety sevices are discribed.

Chapter 2 list in details with added comments the mains trends on issues and good practices that were identified in the period covered.

Each chapter of the report is intended for different levels of management in the operating and regulatory organizations, but not exclusively so. Chapter 1 is primarily directed at the executive management level; chapter 2 at middle managers and those involved in operational experience feedback. Individual findings varied considerably in scope and significance. However, the findings do reflect some common strengths and opportunities for improvement.

Appendix I summarizes all the trends developed in the document in a table form.

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CONTENTS

BACKGROUND

Many of the challenges faced by those responsible for ensuring the safe operation of nuclear power plants are common throughout the world. The results of an OSART mission are, therefore, of interest and possible application to many nuclear power plants and not solely to the plant in which they were originally identified. The primary objective of this report is to enable organizations that are constructing, commissioning, operating or regulating nuclear power stations to benefit from experience gained in the course of missions conducted under the OSART programme during the period January 2003 to December 2006.

In 1983, the IAEA set up the Operational Safety Review Team (OSART) programme to assist its Member States in the enhancement of safe operation of nuclear power plants. The service is available to all countries with nuclear power plants under construction, commissioning or in operation upon a request made to the IAEA by its Member States. 138 missions had been conducted at 90 nuclear power plants in 31 countries by the end of 2006. There had also been 82 follow-up visits to review the implementation of previous OSART results. Twenty-two (22) OSART missions and follow-up visits were conducted during the period 2003-2006. Four (4) Prosper missions were conducted also during the period 2000 - 2006. This report take into account both results in the domain of operating experience feedback.

OSART teams consist of senior expert reviewers from NPPs and regulatory authorities in the various disciplines relevant to the mission. During technical discussions between reviewers and plant staff, operational safety programmes are examined in detail and their performance checked; strengths are identified and listed as good practices and weaknesses are listed as recommendations or suggestions. The criteria used by the teams as they formulate their conclusions are based on IAEA Safety Standards and the best prevailing international practices, and, therefore, may be more stringent than national requirements. OSART reviews should not be regarded neither for regulatory inspections nor design reviews. Rather, OSART reviews consider the effectiveness of operational safety programmes and are more oriented to programme, process and management issues than to hardware. The performance or outcome of the various programmes is given particular attention. OSART teams neither assess the adequacy of plant design nor compare or rank the safety performance of different plants.

The OSART missions consist of three basic types: missions to operating power reactors (OSART); missions to power reactors under construction or at the pre-commissioning stage (Pre-OSART); and Expert missions which cover a limited range of topics or which differ in character from review missions. The IAEA led also Peer Review of the effectiveness of the Operational Safety Performance Experience Review process (PROSPER) and the associated guidelines have been issued in April 2003. In addition, operational safety reviews when combined with design reviews are known as Safety Review Missions (SRMs).

The results of OSART missions completed by the end of 1996 have been summarized in OSART Results, IAEA-TECDOC-458; OSART Results II, IAEA-TECDOC-497; OSART Mission Highlights, 1988-1989. IAEA-TECDOC-570; OSART Good Practices, 1986-1989, IAEA-TECDOC-605; OSART Mission Highlights, 1989-1990, IAEA-TECDOC-681; Pre-OSART Mission Highlights, 1988- 1990. IAEA-TECDOC-763; OSART Mission Highlights 1991-1992, IAEA-TECDOC-797; OSART Programme Highlights 1993-1994, IAEA-TECDOC-874; and OSART Programme Highlights 1995-1996, IAEA-TECDOC-1018. Since 1996 the results of OSART missions have been made available to Member States on OSMIR. OSART mission highlights 2001-2003 – IAEA-TECDOC-1446 was edited in May 2005.

The OSART reviews normally cover nine areas, namely: management, organization and administration; training and qualification; operation; maintenance; technical support; operating experience feed back, chemistry; radiation protection; and emergency planning and preparedness.

Formal guidelines and criteria for evaluating safety culture were formulated and made available to the industry in the form of INSAG-4 in 1991 and then INSAG-15, TECDOC-1329 (December 2002) which provides guidelines for self assessment of safety culture as a tool for safety culture improvement. However, OSART review guidelines and criteria have, from the beginning, included most of the fundamental characteristics of safety culture. Thus, OSART teams have reviewed safety culture in each review area in an integrated manner, as an important part of effective nuclear power plant management. Since October 1992, however, safety culture has been specifically assessed in all OSART missions and follow-up visits, both overall and in each of the nine major review areas.

The OSART Guidelines were revised in June 1999 and have been pilot tested since then, making all necessary improvements. The revision of the OSART Guidelines The OSART guidelines have been conducted and edited under the name Services Series number 12 in 2005. During the review guidance of recent INSAG Reports (INSAG-13: Management of Operational Safety in Nuclear Power Plants, INSAG-15: Key Practical Issues in Strengthening Safety Culture, INSAG-18: Managing Change in the Nuclear Industry, INSAG-19: Maintaining the Design Integrity of Nuclear Installations Throughout Their Operating Life) and requirements of some recent Safety Guides (e.g. NS-G-2.4: The Operating Organization for Nuclear Power Plants, NS-G-1.1: Software for Computer Based Systems Important to Safety in NPPs) are incorporated. The IAEA Safety Review Services were evaluated by an external audit, which recommended to promote the integrated approach to safety assessment. This is also taken into account.

Over the twenty-three-years experience of the OSART programme, significant changes have occurred in OSART methodology, nuclear industry transparency and power plant operational safety practices for in-depth reviews of operational safety. Over this period, the guidelines and experience of OSART team members have also evolved to reflect the higher standards for operational safety practices now being adopted worldwide.

Definitions currently in use by OSART for recommendations, suggestions and good practices are as follows:

Recommendation

A recommendation is advice on what improvements in operational safety should be made in that activity or programme that has been evaluated. It is based on IAEA Safety Standards or proven, good international practices and addresses the root causes rather than the symptoms of the identified concern. It very often illustrates a proven method of striving for excellence, which reaches beyond minimum requirements. Recommendations are specific, realistic and designed to result in tangible improvements. Absence of recommendations can be interpreted as performance corresponding with proven international practices.

Suggestion

A suggestion is either an additional proposal in conjunction with a recommendation or may stand on its own following a discussion of the pertinent background. It may indirectly contribute to improvements in operational safety but is primarily intended to make a good performance more effective, to indicate useful expansions to existing programmes and to point out possible superior alternatives to ongoing work. In general, it is designed to stimulate

the plant management and supporting staff to continue to consider ways and means for enhancing performance.

Note: if an item is not well based enough to meet the criteria of a '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 plant to…).

Good practice

A good practice is an outstanding and proven performance, 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 application to be brought to the attention of other nuclear power plants and be worthy of their consideration in the general drive for excellence. A good practice has the following characteristics:

- novel;
- has a proven benefit;
- replicable (it can be used at other plants);
- does not contradict an issue.

The attributes of a given 'good practice' (e.g. whether it is well implemented, or cost effective, or creative, or it has good results) should be explicitly stated in the description of the 'good practice'.

Note: 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 may be documented in the text of the report. 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 plant. However, it might not be necessary to recommend its adoption by other nuclear power plants, because of financial considerations, differences in design or other reasons.

1. INTRODUCTION AND MAIN CONCLUSIONS

1.1. Summary

During the period between 2003 and 2006, 22 OSART missions and 4 PROSPER missions (2000-2006) reviewed plants in all regions around the world. As a result, the review reports accumulated a number of findings (good practices, recommendations and suggestions) that presents a series of snapshots of the current status of operational safety practices at nuclear power plants (NPPs).

To evaluate the general trends and achievements collected from 21 OSART missions and 4 proper missions during the period between 2003 and 2006, presented in this report, two assessment teams were organized by the IAEA. The assessment teams provide the IAEA with some comments on regard to the future evolutions of the operational safety review programme.

The review shows that everywhere the IAEA teams (OSART and PROSPER) were impressed by the overwhelming number of positive safety culture aspects observed at all the plants. The observed practices show in general a high level of compatibility with the well-established good international practices and plant organizations generally adhere to the IAEA safety requirements.

Plant management and staff show clear commitment to nuclear safety. This lead to the conclusion that "Safety Culture", as a concept, is mature at all plants visited during the period reviewed by this report.

This is not to say that the situation is fully satisfactory. The OSART teams identified numerous domains where further improvements could be made.

The table below shows the number of issues (recommendations + suggestions = 663) and the number of findings (Good Practices + Recommendations + Suggestions = 934) provided to the plants during 21 OSART missions and 4 PROSPER missions. All these findings are the basis of the evaluation proposed in the present document.

	MOA	TQ	OPS	MA	TS	OEF	RP	CH	EPP	Total
Issues	71	51	121	81	46	124	60	64	45	663
Findings	107	75	163	111	69	151	91	88	79	934

Information for the reader on the evaluative vocabulary used in this report:

The task of the assessment team was to evaluate and give a weight to the evaluation. To effectively transpose in wording statistical results, the group of experts decided to use the following statements:

- "In all plants" or "on all cases" is representative of frequency of issues, which were common to more than 90 % of the cases or in more than 19 times out of 21 plant reviews.

- "In many plants" or "frequently" is used for a number of issue items found in about 11 to 18 plants out of 21 missions (from 50% to 90 % of the cases).

- “In some plants” reflects that in 4 to 10 plants out of 21 the OSART found the same issue topic (from 20% to 50% of the cases).

- “In few plants” means that the frequency of finding or the equivalent sort of issues appears in 1 to 3 plants against 21 visits (up to 19% of the cases).

1.2. Issues & trends identified through the operational services

In this sub-chapter all trends with four and more occurrences out of the 21 missions are listed and evaluated. Positive trends are present when positive occurrences (good practices) are higher that negative occurrences (recommendations and suggestions) by four more than four.

Summarize of trends classified area by area:

- Management, organization and administration

- In almost all cases encountered, the local industrial safety policy is not sufficiently clear, or sufficiently well developed to ensure that hazards are minimized. Additionally, there is a failure of some employees/contractors to follow the requirements of their local industrial safety rules and a management’s failure to adequately enforce them (20/21).

- A significant shortfall exists in some cases between management expectations/requirements and the current situation in the field (7/21).

- There are indications that some plants have not yet established mechanisms to adequately resolve issues such as loss of corporate knowledge or recruitment/retention of critical/key/specialist skills (7/21).

- There are some indications that safety culture programmes were found to be fragmented or unfocussed (5/21).

- There are indications in some plants that interfaces with external organizations are not adequately controlled (5/21).

- There are some indications that the quality assurance programme are insufficiently developed (5/21).

- Some plants failed to fully consider all aspects of human performance in their safety programmes (4/21).

- There are indications in some cases that performance indicators are not effectively used to manage the plant activities (4/21).

- Training and qualifications

- In some plants, the training of permanent or occasional instructors, who provide training to the NPP staff, is not sufficiently comprehensive (8/21).

- In some plants, training and coaching programmes for field operators, control room operators and shift supervisors should be more structured and defined, and results of training are not evaluated to ensure the effectiveness of the training (7/21).

- In some plants, the process of the evaluation of the training (policy, procedures, material, performance, adequacy and efficiency) is not formalized or not implemented sufficiently for controlling and maintaining good level of staff training (5/21).

- A clear trend exists that strict application of the systematic approach to training is not fully implemented in some NPPs (5/21).

- Deficiencies still exist in top-level training documents (e.g.: policies) in some plants (4/21).

- Differences between plant equipment and training and simulator equipment were found in some plants (4/21).

- The self-assessment programme of the training activities was found insufficient in some plants mainly because of lack of usage of key performance indicators to enhance training performance (4/21).

- Operations

- Although generally all the plants have established expectations toward the operations, in the field many applications of these expectations still need improvement in their implementation (12/21).

- Many plants do not have consistent policies and practices for the labeling of systems and equipment (11/21).

- For some plants, deficiencies in the control of operational documents were observed including ineffectiveness of the temporary modification process for changes in procedures (9/21).

- In some plants, the system to authorize and properly handle operator aids is not fully developed and rigorously applied (9/21).

- The policy for conducting main control room activities in some plants needs further strengthening (8/21).

- For some plants, improvements are necessary in the implementation of a rigorous approach to control the access to and authorization of the operation of safety related equipment (6/21).

- In some plants, deficiencies were identified in the implementation of the equipment isolation and application of the safety measures to allow maintenance activities in the field (5/21).

- Fire prevention

- The control of the fire risk, including the storage of burnable or/and hazardous material remains an issue in some plants (9/21).

- Some plants need to pay more attention to the maintenance of the fire protection systems and equipment and the effectiveness of their inspection programmes (8/21).

- The comprehensiveness and effectiveness of the fire response organization, in some plant, requires more consideration (5/21).

- Maintenance

- Many plants still need to allocate adequate resources to achieve good material conditions (11/21).

- The implementation of an effective foreign materials exclusion programme remains an issue for some plants (10/21).

- Positive trend: Organization and functions in maintenance area are well established and applied by the plant staff (8/21).

- In some plants, the policy and/or implementation of plant predictive maintenance programmes were not fully adequate (7/21).

- Work practices have room for improvement, mainly in policy establishment and its implementation (7/21).

- Spare part management including arrangement in storage and control of pieces of equipment should be assured in some plants (6/21).

- In some plants, weaknesses were identified in the condition and the calibration of maintenance equipment (6/21).

- In some plants there is a need to improve the preventive maintenance programmes to prevent potential equipment degradation (5/21).

- Technical support

- In many plants, systematic, integrated and independent monitoring and assessments/reviews including trend analysis of safety related system conditions from surveillance results are not fully developed (14/21).

- The temporary modification programme is not sufficiently comprehensive in some plants (7/21).

- In some plants, planning, categorization and review of modification activities were not fully complete (6/21).

- The quality assurance linked to the management of fuel handling activities was not fully implemented in some plants (5/21).

- Operating experience feedback

- In many plants, low-level events and near misses are not sufficiently reported, not handled systematically or even not considered in the OE process. Therefore, low level event and near misses are not systematically utilized to identify weaknesses, error likely situations and early warnings of potential declining performance (17/21).

- In many plants, there is no clear integrated oversight process, nor a consistent understanding at individual level of the overall ownership of the OE process. Additionally there is insufficient awareness of the implications of each individual contribution to the overall OE process.

- Insufficient consideration, including guidance and training, and utilization of external operating experience are adopted in many plants.

- In many plants, the corrective actions programme do not systematically include all agreed actions resulting from internal and external operating experience; interfaces between organizations involved in corrective actions; and the evaluation of the timeliness and effectiveness of the implemented corrective actions.

- In some plants timeliness of event investigation and analysis process was not proper and the evaluation criteria for performance indicators was not enough to make them more challenging and better reflect the real situation in this area.

- In some cases, an event classification system, a formal screening process, a sets of indicators and challenging objectives were not always established to assess the significance of the events, to assign actions and produce management reports on these defect/events.

- In some plants, guidance on trending and a coding system for trending reviews and analysis of reported event is not always comprehensive for establishing the significance of the event.

- In some plants, the utilization and dissemination of operating experience information is not part of a systematic process. In and out coming national and international information should be timely reviewed.

- In some plants, the self-assessment procedure is not detailed enough to ensure that all items present in the programme are assessed. Performance indicators associated with Operating Experience are not always fully utilized to question anomalies within the process regarding operational performance.

- Radiation protection

- In almost all plants, insufficient and/or inadequate and /or non effective contamination control was in place (21/21).

- In many plants, dose limitation measures were not sufficiently comprehensive (11/21).

- In some plants the programme for the minimization of waste is neither clearly defined in documentation nor supported by line management (10/21).

- In some plants, radiation protection instrumentation was found to be inadequately maintained (8/21).

- Chemistry

- In many plants, weaknesses were identified in laboratory quality control and in the use of some computer applications (18/21).

- In many plants, the chemistry control programme is incomplete and should be improved (17/21).

- Inadequate/insufficient labeling and storage conditions of chemical or hazardous substances and missing or incomplete categorization for use of chemicals in specific areas/operating systems were found at some plants (10/21).

- In some plants, specifically in laboratories, hazardous chemicals, including also sample and reagents, were insufficiently labelled or improperly stored despite presence of requirement in plant procedures (8/21).

- Deficiencies in the control of chemistry instrumentation exist at some plants (4/21).

- Emergency planning and preparedness

- In some plants, there is a lack of timely response to ensure that appropriate actions are taken during emergency situations (10/21).

- Positive trend: In some plants emergency exercises are well developed (7/21).

- Positive trend: Indications exist that some plants developed good working relations with outside Agencies and local communities (6/21).

- In some plants emergency plans were insufficiently comprehensive to cover both non-nuclear and nuclear hazards (6/21).

- The procedures in some plants do not effectively ensure that key activities such as evacuation process, personnel accounting and staffing of emergency facilities are adequately managed (5/21).

- In some plants the adequacy of equipment required to ensure effective management of an emergency plan was insufficient (4/21).

Future evolution of operational safety services

The IAEA may emphasize in the future the systematic application of formal human resources management tools in order to enhance the expectations in this area in line with the emerging positive results from the efforts noticed in some utilities. Specifically IAEA may encourage the development of techniques to resolve the issues of loss of corporate knowledge.

In the future, the IAEA may encourage the systematic application of best practices from comparable "non nuclear" (conventional) industry in order to align expectations in the area of industrial safety.

In the future OSART mission experts may focus on the appropriateness of training facilities, equipment and materials supporting maintenance and technical support activities. Collecting good practices may provide to plants some hints to improve their programme.

The continuous improvement in training activities, which is evident in many plants, should be supported by the increase of qualification of permanent and temporary instructors. The assessment of that topic may be emphasized in OSART review.

Prevailing number of the good practices in the area of operator supports is related to effective communication means and improvement of man-machine interface by use of modern computer systems. That tendency can be further explored by the IAEA if the best practices will be systematically collected and made available to plant operators.

The industry is raising the level of good practices in the development and implementation of different training scenarios and tools for fire and rescue drills. In the future a better approach for exchange of these new tools may significantly increase other plants fire response effectiveness.

OSART reviewers may actively seek good practices in the area of operating rules and procedures to facilitate further improvement in this area.

OSART reviewers should actively focus on good practices associated with the management of "beyond design basis accidents" and "severe accidents" to enable the development of appropriate standards and guidance in these areas.

The review on maintenance work control resulted in a low number of findings. Further improvement could be precipitated by OSART reviewers actively seeking for additional examples.

The IAEA may consider developing some standards or guidance documents for reviewing decision making using PSA, long term operation and ageing management.

During four years, only one issue associated with "reactor engineering" was identified. To pursue continuous improvement in this area, the IAEA should focus on upgrading the review contents in this area and update the next version of the OSART Guidelines.

The IAEA may consider collecting and disseminating good practices to increase the individual awareness of operating experience process including the reporting of low level events and near misses.

There is a topic "Radiation Protection Support during an Emergency" with a limited number of findings – this trend being consistently observed through last 8 years. The IAEA may review the established standards for this topic and consider the necessity to improve the review document in the future.

In the Chemistry area there is a topic named "Chemistry Operation History" with almost no findings; this trend being consistent through last 8 years. The IAEA may review established

standards for this topic and consider the necessity to modify the OSART guidelines in the future.

2. ASSESSMENT OF THE OSART MISSIONS RESULTS AREA BY AREA

The following detailed evaluation of different topics of the review summarizes the outcome of the trends and tendencies identified from the findings as well as lack of them in some cases.

Important trends are presented in a bullet form with the purpose to be used as stand alone input to other evaluative documents. Where the facts or findings from the OSART missions addresses common problem the issue trend is complemented with a discussion on the findings weight and possible remedial actions.

In this evaluation an attempt to define the level relevant to the different findings (policy establishment level or policy implementation level) is done in order to facilitate the future use of the results.

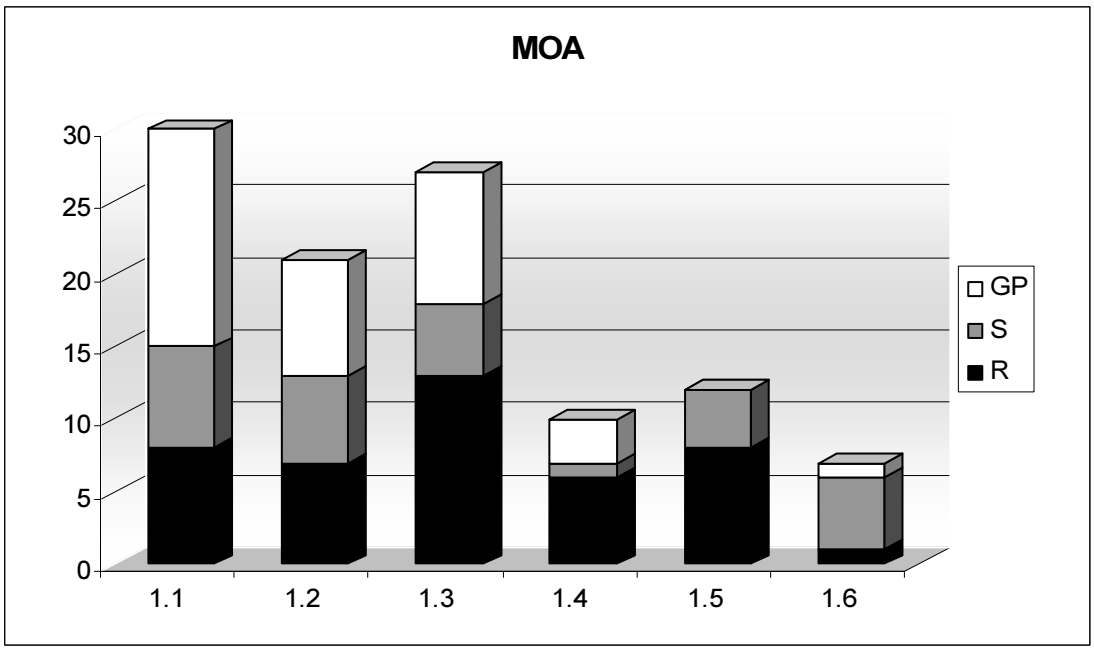
In addition, the lack of findings in particular area of reviews also is discussed as possible area of further attention from IAEA.

2.1. Management, Organization and Administration

2.1.0. Summary results from the evaluation

During the period of this report, the OSART teams identified 71 issues in the Management, Organization and Administration (MOA) area. Of these 43 were recommendations and 28 suggestions. 36 good practices were also identified. These relatively high numbers are an indication of the attention this area attracts from both the OSART teams and plant management. However, despite the high number of good practices identified there were still a high number of issues raised. This indicates that the plants still have more improvements to make before reaching the best international standards.

Title		Rec.	Sug.	GP	Total
1.1	Organization and administration	8	7	15	30
1.2	Management activities	7	6	8	21
1.3	Management of safety	13	5	9	27
1.4	Quality Assurance programme	6	1	3	10
1.5	Industrial Safety programme	8	4	0	12
1.6	Document and records management	1	5	1	7
Total		43	28	36	107



It is important to note that despite the relatively large number of good practices identified during the 21 missions, they are often of a disparate nature and do not easily support each others in the development of trends.

2.1.1. Organization and administration

During the reviewed period of this report, the OSART teams identified 15 issues in this topic area. Of these 8 were recommendations and 7 suggestions. A total of 15 good practices were also identified.

- *Trend: There are some (7/21) indications that plants have not yet established mechanisms to adequately resolve issues such as loss of corporate knowledge or recruitment/retention/development of critical/key/specialist skills.*

Similarly, issues associated with the assessment and development of individuals within plant structures and the evolution/development of the structures themselves are of concern. This is particularly noticeable in the key areas of ensuring independence, accountability and clear lines of authority.

However, adequate tools are available and are in use at some plants were these issues are being managed by emphasis on communications, teamwork and employee involvement.

- *Trend: There are some indications (5/21) that the management of some interfaces with external organizations is not adequately controlled.*

Concerns were identified, which were associated with interfaces between the plant and external organizations such as the regulator and/or contractors. Additionally, the needs to adequately prepare for major transitions at the corporate level were identified.

However, the OSART teams did identify a number of improvement initiatives in these areas were plant management were using schemes to mitigate such problems. Sometimes these schemes were innovative and often they were well-applied standard management tools.

- *Trend: There are some indications (4/21) that in some cases performance indicators are not effectively used to manage the plant activities.*

Plants commonly set goals to drive performance and change. Similarly plants gather data in the form of indicators. The results of missions show that, in some instances, plants do not yet have mature, integrated systems and are not taking full advantage of all opportunities in these areas. Similarly, there are indications that these systems are not being used to effectively manage peak work-loads and/or backlogs.

2.1.2. Management activities

During the period of this report, the OSART teams identified 13 issues in this topic area. Of these 7 were recommendations and 6 suggestions. Additionally, 8 good practices were also identified.

- *Trend: There are some indications (7/21) of a significant shortfall between management expectations/requirements and the current situation in the field.*

It is now a common practice for plant management to use tools such as "goal and target setting" and "performance indicators" to drive improvements and change. Similarly, plants frequently have established a set of standards or expectations that the employees are required to meet. However, there is a trend from the mission reports of significant shortfalls between management expectations/requirements and the actual situation in the field. The reasons for this appear to be twofold. Firstly, there are strong indications that management requirements are sometimes not sufficiently challenging or are not adequately communicated. Secondly, and probably more importantly, there are clear indications that the required standards of behaviour/compliance are not being sufficiently enforced by the actions of management. Specific issues that were identified during missions include: inadequate use of procedures, excessive delays in the correction of defects, acceptance of poor material condition and concerns regarding adequate fitness for duty.

The same issue (2 recommendations) was also raised and emphasized by the OSART team in operations area (chapter 2.3.1)

It must be noted that the missions also identified examples were plant management have recognized these issues and have introduced strong mitigating policies of self-assessment and the requirement for management presence in the field.

2.1.3. Management of safety

During the period of this report, the OSART teams identified 18 issues in this topic area. Of these 13 were recommendations and 5 suggestions. Additionally, 9 good practices were also identified.

- *Trend: There are some indications (5/21) that safety culture programmes were found to be fragmented or unfocussed.*

Although plant commitment to safety and continuous improvement is clear, there are indications that the safety culture programmes on some plants were, as yet, still fragmented or unfocussed. In a number of cases international best practice had not been adopted. Particularly, tools such as "Self-assessment" and "Goal setting" were under-utilized.

- *Trend: Some plants (4/21) fail to fully consider all aspects of human performance in their safety programmes.*

In a number of plants not all opportunities were being taken to incorporate aspects of human performance into safety improvement planning/assessment. In some instances, this significant contribution was secondary to essentially technical considerations. It was more commonly found that aspects such as communications, enforcement of expectations, supervision and coaching were weak. It was noted that plants do not always include an individual's personal safety performance in their assessment (Succession planning) processes.

However, there was also an indication that some plants have committed a significant effort to the development of their safety programmes, with a number of initiatives designed to improve safety awareness generally. Notably, the objective was to improve safety culture and to reinforce self-assessment and mutual support/teamwork between employees, particularly by the introduction of "no-blame" cultures.

2.1.4. Quality assurance programme

During the period of this report, the OSART teams identified 7 issues in this topic area. Out of these, 6 were recommendations and 1 suggestion. Additionally, 3 good practices were also identified.

- *Trend: There are some indications (5/21) that quality assurance programmes are insufficiently developed.*

All plants had quality assurance programmes that are used to provide information regarding quality and safety performance. However, some plans were inadequate in scope, or were not effectively used to monitor/manage activities such as corrective actions or employee feedback.

2.1.5. Industrial safety programme

During the period of this report, the OSART teams identified 12 issues in this topic area. Of these 8 were recommendations and 4 suggestions. No good practices were reported. Trends can be identified:

- *Trend: There are some indications the local industrial safety policy is not sufficiently clear, or sufficiently well developed to ensure that hazards are minimized (7/21).*

There are clear indications that several plants have not fully developed their industrial safety documents into a sufficiently clear and coherent policy. This was manifested in a variety of ways, from lack of control of temporary storage areas (with associated hazards – notably fire) to unidentified/unrecognized hazards in the field.

- *Trend: There are many indications that employees fail to follow the requirements of their local safety rules and management fails to adequately enforce them (13/21).*

The missions identified a trend which clearly shows that some employees do not always comply with local safety requirements and, importantly, that managers do not always reinforce these requirements either to their own staff or contractors (7/21).

This was particularly evident in the failure to comply with the wearing of personal protective equipment and in the adherence to rules prohibiting smoking in inappropriate areas. Failure to require contractors to comply with safety rules was also identified during the missions (5/21).

2.1.6. Document and records management

During the period of this report, the OSART teams identified 6 issues in this topic area. Of these there were 1 recommendation and 5 suggestions. One good practice was identified.

- *Trend: There are a few indications (3/21) that plants' local arrangements did not provide a comprehensive control of aspects of their documentation system*.

Issues, which include gaps in the coverage of policies, weaknesses in processes for reviewing documents and the use of modified/uncontrolled documents in the field were identified at a number of plants. When taken together, it can be suggested that the subject of document control may not be a focus of management attention.

2.2. Training and qualification

2.2.0 Summary results from the evaluation

The review of the training and qualification (TQ) area through 21 visited NPPs resulted in 75 findings from which are 24 good practices, 19 recommendations and 32 suggestions.

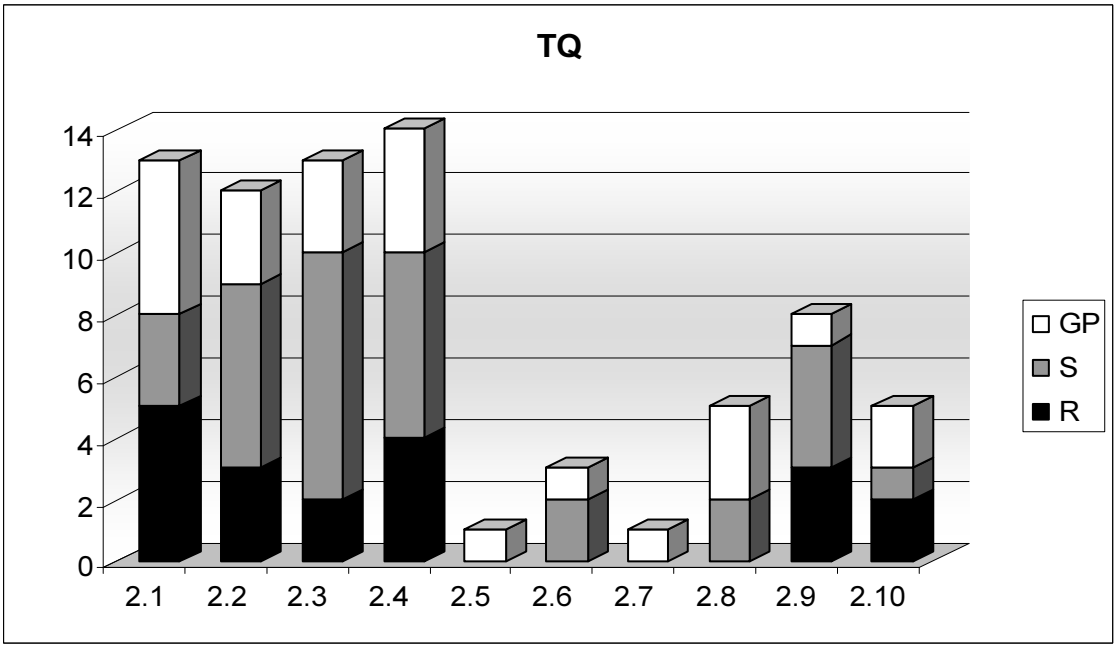
The distribution of the findings between the different topics of the TQ review is presented in the table below:

Title		Rec.	Sug.	GP	Total
2.1	Training policy and organization	5	3	5	13
2.2	Training facilities, equipment and material	3	6	3	12
2.3	Quality of the training programmes	2	8	3	13
2.4	Training programmes for control room operators and shift supervisors	4	6	4	14
2.5	Training programmes for field operators	-	-	1	1
2.6	Training programmes for maintenance personnel	-	2	1	3
2.7	Training programmes for technical plant support personnel	-	-	1	1
2.8	Training programmes for management and supervisory personnel	-	2	3	5
2.9	Training programmes for training group personnel	3	4	1	8
2.10	General employee training	2	1	2	5
Total		19	32	24	75

In addition there is one suggestion in the commissioning area, which deals with TQ.

Note: Several issues on training were developed directly in the Maintenance, Technical Support, Chemistry and Emergency Planning and Preparedness areas. These findings are not added to the previous table, however added when evaluating the trends. By consequence in some cases the number of issues collected to define trends is not matching the data in the previous table.

The following evaluation summarizes the outcome of the trends and tendencies identified from the findings.



2.2.1. Training policy and organization

During the period 2003-2006, OSART identified 13 findings divided into 5 good practices, 5 recommendations and 3 suggestions.

- *Trend: Enough issues were gathered to find a clear trend showing that in some plants deficiencies remain in the top-level documents such as training policies (4 issues out of 21 reviews) (3R, 1S).*

For example the training policy does not include some internationally recognized standard aspects. Training objectives are written in too general form to be sufficiently comprehensive.

However the OSART identified two good practices when plants established special committees that provide oversight and direction to the training division. This committee ensures that training is used to improve plant performance and is meeting the needs of the line organizations.

- *Trend: In some plants the process of the training evaluation is not formalized enough or not implemented sufficiently to effectively control and maintain staff training (5 issues out of 21 missions including 1R and 4S).*

E.g. Job and task analysis are not fully completed. A formal process is missing for establishing training evaluation. Assessment of the training effectiveness is not provided during training sessions.

However, the OSART identified 2 good practices in this area. One good practice when plant managers assess staff skills using a skills' mapping tool, which allows managers to better identify any specific skills needed as well as to develop an action plan to ensure their teams' continuing ability to carry out their responsibilities. The second good practice is in the implementation of human performance tool in training session to enforce management expectation.

- *Trend: Clear trend exists that strict application of the Systematic Approach to Training (SAT) is not fully implemented in some NPPs (5 issues out of 21 reviews including 4R and 1S).*

More rigors should be applied to ensure that allocation of resources as well as clear procedures are supporting SAT implementation. On-the-job training should be treated with the same level of quality as the classroom quality.

2.2.2. Training facilities, equipment and material

During the period in reference, OSART provided 9 areas for improvement including 3 recommendations and 6 suggestions. Three good practices support this chapter.

- *Trend: In a few plants, training facilities and training equipment are not sufficient or are not being properly maintained to satisfy established requirements (2 issues out of 21 missions) (2S).*

It often deals with insufficient both policy and procedures for maintaining their quality.

However, the OSART identified also two good practices when plants established and maintain training facilities that provides outstanding on-the-job training for the staff of various areas.

- *Trend: There is a trend that (4 issues out of 21 missions) (1R, 3S) in some plants, systems and equipment are not sufficiently represented into the simulator and other training facilities.*

Differences exist between referenced unit and simulator. These gaps should be well identified and tracked. Procedures are missing to ensure that periodic operability tests are running to verify simulator compliance with pre-defined performances. There are some deficiencies and limitations of the full scope simulator.

In the training areas for maintenance personnel some training materials, models, mock-ups, training facilities, workshops, and scenarios have not been fully developed. Training workshops and laboratories are not fully equipped with dedicated components. Specific Industrial Safety mock-ups and mock-up to train employees on radiation protection purposes are missing.

2.2.3. Quality of the training programmes

During the referenced period 2003-2006, 13 findings were proposed by the OSART, 2 recommendations, 8 suggestions and 3 good practices.

- *Trend: The self-assessment of the training was found insufficient in some plants mainly because of lack of usage of key performance indicators to enhance training performance (4 suggestions out of 21 reviews).*

No feedback is organized on the training programmes as well as no formal process to evaluate training activities. One explanation could be a lack of communication between the training and customer departments.

However, one example *(1GP)* shows that for maintenance personnel training, plant has identified acceptable and non acceptable practices by using modern tools such as video

presentations intermixed with instructor presentations, questioning sessions and group discussions. Another good practice *(1GP)* was identified when training center got accreditation (license) from Ministry on 22 training programmes.

- *Trend: In some NPPs OSART observed weaknesses in the training documentation system related to the area of training overview, training needs and job specific training (5 suggestions out of 21 missions).*

No formal procedure exists to allow incorporation of external training experience. No clear guidance is in place for the development of training material. Training coding and records are not presented in a quality controlled format (2S).

However, two (2) plants succeeded to relocate engineering support for developing a preparation guide to allow management and staff to closely review annual performance assessment including training needs interviews.

2.2.4. Training programmes for control room operators and shift supervisors

Between 2003 and 2006, 14 findings support this chapter. Four recommendations, 6 suggestions and 4 good practices were developed.

- *Trend: In some NPPs (7 issues out of 21 missions) (4R, 3S) there are weaknesses in training programmes. The training process for control room operators and shift supervisors is not well enough organized to ensure effective training results*.

As example, control room crews are not (1R, 1S) refreshed on practical training on remote (real and simulator) shutdown panels operation

For example, instructors do not sufficiently coach trainees for them to adhere to policies, strictly follow procedures and simulate real behaviour. Performance of the trainees is not sufficiently evaluated in some plants. Instructors also do not implement structured evaluation (critique) of continuous simulator training and no performance indicators help to assess the efficiency of the training (3R, 2S).

However, in some visited plants (5GP) management developed innovative methods for continuous evaluation of trainee performance (coaching and shadowing) during initial and continuing simulator training. Plants use an expertise follow-up log. Useful educational tools exist to improve data and records search.

2.2.5. Training programmes for field operators

No specific suggestions were developed under this sub-chapter during 21 OSART missions from 2003 to 2006.

- *No trends.*

If any, weaknesses found in the training programmes for field operators are the same than for control room operators so developed in the same issue or listed as weak training programmes. Potential trend here is included in the previous chapter 2.2.4.

2.2.6. Training programmes for maintenance personnel

Very few findings reported in the Training and Qualification area are supporting this chapter. Two suggestions and 1 good practice were gathered during 21 OSART missions.

- *Trend: In few plants there is lack of resources for providing sufficient training for maintenance personnel (3 suggestions over 21 reviews).*

Not enough full-time instructors are devoted to conduct required on-the-job training (from Operation area). Training programmes and materials do not cover all maintenance tasks (from Maintenance area).

On the contrary in few cases (3GP) Maintenance (Mechanical, Electrician and Instrumentation and Control) and Engineering personnel are trained at simulator to support operations crews in operation scenarios and emergency situations.

2.2.7. Training programmes for technical support personnel

No issues during the period 2003-2006 were detected by OSART. Only one good practice is supporting this area.

- *No trends.*

The OSART guideline and the OSART working notes outlines are well developed in this area, nevertheless no trends appear to be significant. In general high level educated specialists and well trained Engineers are working in technical support departments and training weaknesses are not a noticeable characteristic. Moreover in the OSART guideline a chapter is devoted to Qualification of technical support personnel which probably overlap the specific training area in this chapter 2.2.7.

2.2.8. Training programmes for management and supervisory personnel

Two suggestions and 3 good practices were identified in this area during 21 OSART since 2003.

- *Trend: In few cases (3 suggestions out of 21 missions including 2 suggestions from this TQ area and 1 suggestion from EPP area) responsible senior management members are not trained enough in accordance with their roles and responsibilities.*

Senior managers involved in the management of severe accidents do not take refreshing training lessons or drills. Some drills are not sufficiently comprehensive upon this topic (developed in EPP area).

However the OSART identified an increase of the training programmes for management personnel in some plants *(3GP)*. Good training programmes for management at various management levels are available such as Master in Business and Administration (MBA), or international courses, or international reviews. Self-study activities exist to also improve the management skills, training arrangements for the promotion and substitution of management personnel (turn-over).

2.2.9. Training programmes for training group personnel

Eight findings composed of only 1 good practice, 3 recommendations and 4 suggestions were provided by the OSART.

- *Trend: In some NPPs training of the permanent and occasional instructors, who provide training to the NPP staff, is not sufficiently comprehensive (8 issues out of 21 missions including 3R and 5S).*

For example training is being conducted by NPP experts not trained in instructional skills, insufficient training of supervisors/tutors of shadow training, and no formal requirement for enlisted instructors for providing of the training, etc. A suggestion added here is coming from numerous facts in an issue developed under quality of training programme which shows that training skills and knowledge are most addressed. In few cases, simulator instructors do not receive on-time re-qualification. In few cases pedagogical training and guidance of the tutor or supervisor (or first line managers) in charge of "shadowing" are missing. In few cases, occasional instructors are not evaluated prior performing education. Up today no good practice was developed directly to this important topic.

2.2.10. Training programmes for general employee training

Two recommendations, 1 suggestion and 2 good practices are the finding proposed to 21 plants during the period 2003-2006.

- *Trend: In few plants insufficient entrance and refresher training (3 issues out of 21 missions) (2R, 1S) is provided to plant staff and contractors.*

Development, content and implementation are partly missing. Tests appear sometimes to be of insufficient level of challenge.

However, E-learning (Electronic-learning-Computer based training courses) starts to be used more and more and it is evaluated as efficient (1GP). Safety culture aspect is generally taught by senior line managers to enforce and promote field application of the safety culture (1 GP).

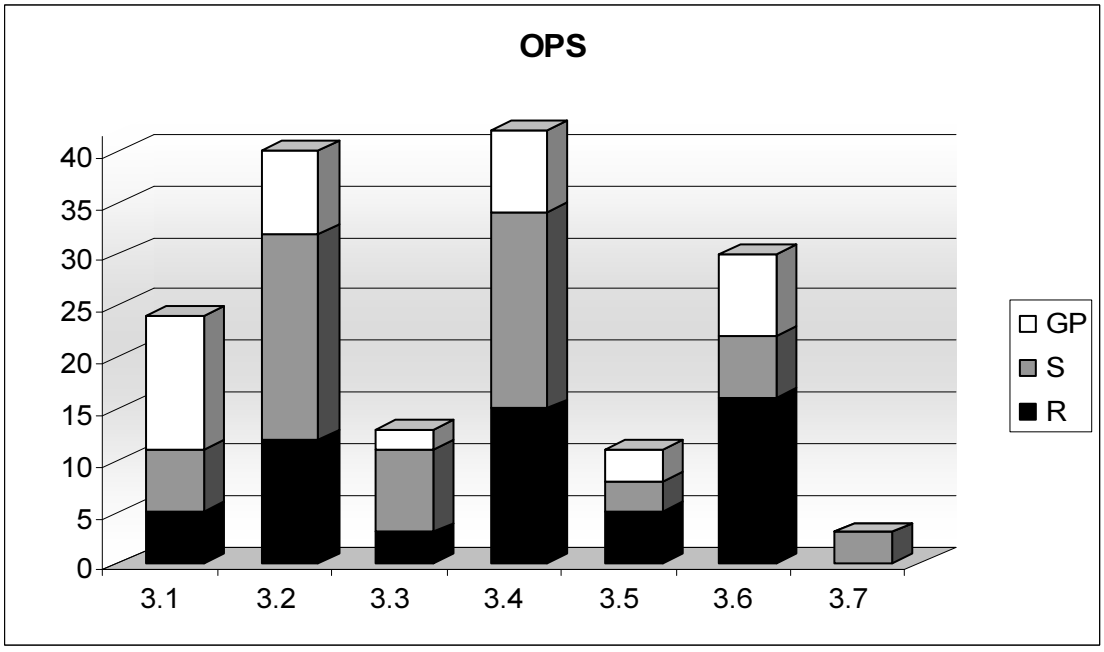
2.3. Operations

2.3.0 Summary results from the evaluation

The review of the operations area by the twenty one (21) visited plants resulted in 163 findings from which 56 are recommendations, 65 are suggestions and 42 are good practices.

The distribution of the findings between the different topics of the review is presented bellow:

Title		Rec.	Sug.	GP	Total
3.1.	Organization and functions	5	6	13	24
3.2.	Operations facilities and aids	12	20	8	40
3.3.	Operating rules and procedures	3	8	2	13
3.4.	Conduct of operations	15	19	8	42
3.5.	Work authorizations	5	3	3	11
3.6.	Fire prevention and protection programme	16	6	8	30
3.7.	Management of accident conditions	-	3	-	3
Total		56	65	42	163



In the area of organization and functions majority of findings have been evaluated as good practices. The small number of the issues does not allow the development of some strong trends although some repeating problems are identified in areas of the effectiveness of the refreshment training on the shift staff after prolonged absence; of the effectiveness of the management oversight; and the communication of the management expectations to the staff.

Within the good practices the emphasis is given to the different aspects of the human resources management, including development of effective self-assessment practices, human performance enhancement or staff succession plans. The IAEA may use these results to emphasize in the future the systematic application of formal human resources management tools in order to enhance the expectations in this area in line with the emerging positive results from the efforts of some utilities identified during the missions.

Reviewing the area of facilities and operator aids, a significant number of identified issues shows a strong trend in several important directions such as weaknesses identified in the policies and practices for consistent equipment and system labeling or lack of a rigorous approach for proper handling of operator aids.

The prevailing number of the good practices in this area is related to the insurance of effective communication means and improvement of the man-machine interface by use of modern computerized systems. That tendency may be further explored by the IAEA if the best practices are systematically collected and made available to the plant operators worldwide.

In the area of operating rules and procedures, the dominant trend shows a need of increased effectiveness of the document control to ensure that the staff is always provided with updated and verified procedures.

The same effort should be pursued to ensure that temporary modifications to the procedures are done in a proper manner. In addition, few repetitions are observed in the document control and in the control over the Operating Limits and Conditions (OLC).

The area of conduct of operation gathers the major group of issues within the operation section review. The prevailing number of issues allows development of some strong trends in the weaknesses of the operations in field, policies to conduct main control room activities and lack of rigorous approach to control access to safety related equipment.

Few findings are related to the outcome of the reviews in the area of work authorization, which shows that generally the plants have well organized processes. However a concern has been identified in the effectiveness of the equipment isolation for conducting maintenance works.

In the area of fire prevention and protection the reviews show that generally the plant management pays due attention to the importance of the fire prevention and protection programmes. Nevertheless all identified issues are forming strong trends in the areas of control of the conditions of the fire protective systems and control of the plant fire risk. In addition, an important common issue is the comprehensiveness of the fire response organization including the specific areas of training, adequacy and effectiveness of the organization of different fire prevention programmes.

The good practices identified in this topic also show a trend being oriented mainly in development and implementation of different training scenarios and tools. Indirectly it shows that in this area the industry is raising the level of the average good practice. In the future a better approach for exchanging these new tools may significantly increase the other plants fire response effectiveness.

The topic of management of accident conditions brought up very limited issues. That shows the appropriateness of the attention paid by the plant management on these issues. However,

at the same time this evaluation shows that the current review process has room for improving its effectiveness. In this area the IAEA still did not established expectations in the guidance for conduct of operation for management of beyond design basis accidents and severe accidents although the subject is well in the focus of the nuclear industry.

As seen from the assessment of this area, not a single good practice was identified by the review teams. It confirms the need of systematic efforts to collect the available experience and to establish more consistent expectation level as to motivate forces from the different plants.

2.3.1. Organization and functions

In the area of organization and functions during the evaluated missions altogether 24 findings were identified, prevailing part of them being good practices (13). The issues were almost equally judged as recommendations (5) and suggestions (6).

Most of the issues are associated with the policy of establishing the required operating structure within the plant and its management.

The small number of the issues (almost one per two missions) and the domination of the good practices in this area show that plant management pays serious attention on this important topic and good achievements are evidently in place.

In the same time it does not allow the development of some strong trends although some repeating problems may be identified by the matter of the issues:

- *Trend: In few plants, lower effectiveness of the conduct (including the control over the results) of the refreshment training on the shift staff after prolonged absence was observed (2/21).*

The established policy was found as not sufficiently effective, which led to suggestions offered by the review teams in two cases.

- *Trend: In few cases the management oversight was found to be not sufficiently effective or not well organized (2/21).*

Two suggestions to improve the established policy were formulated by the OSART teams.

- *Trend: For few plants improvements were recommended at the policy level where communication of the management expectation to the staff was found to be not sufficiently effective (2/21).*

Two recommendations to improve the established policy were formulated by the teams. These two recommendations supplement issues developed in MOA area (chapter 2.1.2 Management activities).

Other areas for improvement were suggested at the policy level. The assurance of proper coordination between the different teams and more effective support to the staff on shift should be further defined.

The good practices identified are applicable not only to the policy but also to the practical implementation of the effective management tools in the area of organization.

The emphasis is given to the different aspects of the human resources management, including development of effective self-assessment practices, human performance enhancement or staff succession plans.

This leads to the conclusion that the IAEA may emphasize the systematic application of formal human resources management tools in order to enhance the expectations in this area in line with the emerging positive results from the efforts of some utilities identified during the missions.

2.3.2. Operations facilities and operator aids

The review of the area of facilities and operator aids raised number of findings – 12 recommendations and 20 suggestions. Only 8 out of 40 findings were good practices.

The valuable issues show that in this area additional management attention and efforts are needed both in achieving the consistency with the good international expectations and in developing effective good examples for the benefit of the industry.

Currently the prevailing part of the good practices is connected with the insurance of the effective communication means and improvement of the man-machine interface or the operator support by use of modern computer systems.

Most of the identified 32 issues are in the implementation area, which shows that although the required policy is generally established its actual implementation into the day-to-day plant operations remains in the agenda.

The significant number of identified issues shows strong trends in several important directions:

- *Trend: Frequently the plants have different weaknesses identified in the policies and practices for consistent equipment and labeling system (11/21).*

More than 30% of the identified issues (11 issues out of 32) are concentrated in this area, which shows the common character of the problem and the importance of exposure to the plant management attention.

Most of them are concentrated into the consistent implementation of the established policy due to the fact that for most of the plants the required policy is well established while its real application in the field still requires efforts.

It is worth to mention that the majority of the issues are ranked as “suggestion”, which indicates that in general the plant efforts so far resulted in an average level which is fairly consistent with the good international practice worldwide.

However, at the same time a good practice on rooms labeling is identified confirming that, in few cases, efforts in this field are showing good results.

The trend shows that the issue on maintaining consistent level of the plant labeling during its operation should continue to be the priority of the operations management.

- *Trend: Some plants still do not have a rigorous approach for proper authorization and use of the operator aids (9/21).*

The issue is about the proper authorization and use of operator aids, which have almost the same weight in the mission issues (9 issues out of 32) as the previous one. 4 out of 9 are recommendations. This indicates that, in this area, the established practices are not in

accordance with good international practices. This also shows that the plant management needs to place efforts to identify what approach should be developed to cope with required status.

Almost all issues are associated with deficiencies identified at the policy level (sometimes lack of any established policy in the area). Consistent and formal operator aids policy is one of the directions where the plants should implement important progresses. Highlighting the issue during the different operational safety improvement initiatives, like training seminars and workshops would allow to awake management awareness.

Number of issues (5 issues out of 32) in the operator facilities and aids area is oriented to the use and condition of the control rooms, especially the management of the control boards. Nevertheless within this category a single trend could not be identified due to the different matter of the issues identified. Remarks are as wide as the control board conditions and protection, habitability issues, optimization of the main control room (MCR) conditions, etc.

In this area also several good practices are identified by the review teams, which show that the management attention to the issue is in place and generally the conditions of the control rooms and control boards are in line with the good international practice.

As a positive outcome from the issues trends it should be underlined that the conducted missions resulted in a limited number of recommendations and suggestions in the area of housekeeping, including leaks, work places lighting, etc. (4 out of 21 missions). This shows a very positive trend toward preservation of good plant and system operating conditions and has direct relationship with the level of safety culture achieved and maintained in the majority of the utilities worldwide.

2.3.3. Operating Rules and Procedures

In the area of operating rules and procedures few findings were formulated by the review teams. The overall number of the issues (11 for 21 missions) shows first that the teams generally found acceptable level of performance in this area and second that strong trends of weaknesses cannot be formulated based on that limited number of data.

The identified issues (3 recommendations and 8 suggestions) are equally distributed between the policy and implementation areas which also do not shows any trends as a basis for assessment from the point of view of the issues origin.

Nevertheless several issues show a good basis for trending. Altogether 9 out of 11 issues in the area are oriented actually in the following two directions:

- *Trend: Deficiencies in document control were identified in some plants namely assurance of updated and verified operating procedures for the staff on shift as well as ineffectiveness of the temporary modifications process for the procedures (9/21).*

The importance of the issue is well highlighted in the relevant IAEA guidance. It should be expected that the plant self-assessment process would identify such problems well before the international review missions.

- *Trend: Few plants still show weaknesses in the control over the operational limits and conditions (2/21).*

In one occasion, comments are related to the clarification of the safety requirements in the plant LCO document and in another – on the system for control over the LCO entry time. Both issues are very well presented in the IAEA guidance documents. A timely benchmarking as part of the plant self-assessment process should be promoted to help in full elimination of these issues during the future missions.

Another important outcome is that no issues are identified in the important area of content and structure of the normal operating procedures. Only in one occasion a recommendation was made in the area of alarm control. In the area of Emergency Operational Procedures (EOPs) completeness, just one issue was proposed at the level of suggestion formulated on a plant preparing for operation.

Lack of important issues in these directions is a sign that in the area of procedures and operation rules the plants have established consistent policies and practices coherent with the well established international requirements, presented in the IAEA guiding documents.

In the same period the review revealed only one good practice associated with the implementation of the control over the surveillance test results. Another good practice was identified connected with the operator aids. Both have relationships with application of the modern computerized systems discussed in the chapter 2.3.0.

OSART team should seek for more good practices in the area of operating rules and procedures to gather in OSMIR Database. Future exchanges of good practices in that matter will further promote the safety enhancement process.

As an example, no good practices were formulated in the area of computerization of the procedure although the process is emerging all around the world. That may be seen as a solution to resolve the document control issues. Some more examples of good practices in this area are presented in chapter 2.3.2. But it is worth to mention that as a principle the findings (issues and good practices) are not related to the growing use of computer information systems in the processes of procedure development, storage and usage. Already significant experience is accumulated by the plants.

2.3.4. Conduct of operations

The 1994 revision of the OSART Guidelines included under the chapter 3.4 the review of the chapter “Operating history”. The actual application of the reviews showed that in this area no valuable results were identified mainly because of the overlapping with other areas in the Technical Support sections and latterly introduced Operational Experience Feedback section.

Since the publication of the new 2005 revision of the OSART Guidelines the chapter “Operating history” was excluded from the review within the Operations section. In fact the review of the results from the missions conducted between 2003 and 2006 confirms that there was no finding (issues or good practices) in the former area chapter 3.4. That is a confirmation that the decision taken to eliminate this part of the review enhances the overall effectiveness of the review process.

With its 42 findings for 21 missions the area of conduct of operations creates the major group of issues within the operation section (two findings per mission). In the same time the portion of the identified good practices is comparatively low (8 good practices - less than 20%)

which shows that still the development of best effective practices needs management attention.

The prevailing number of issues (26 out of 34 findings) allows development of certain trends. Most of them are in the area of policy establishment. This shows that the conduct of operations should be further more an important field for clarification within the plant policy establishing and declaring clear and consistent policies in accordance with the IAEA guidance.

Most of the good practices identified are in the area of implementation techniques in relation with different specificities of the conduct of operations i.e. shift turn over process, communication in control room, surveillance tests assessment tools, etc.

- *Trend: Although generally all the plants have established expectations toward the conduct of operations, in the field many applications of these expectations still needs improvements in their implementation (12/21).*

The dominating trend (12 issues for 21 missions) identified during the missions is associated with lower effectiveness of different aspects of the field operation. These are mainly:

  – the organization and effectiveness of the operators rounds,
  – the reporting of non-conformities and deficiencies in the field and
  – the effective operations in the field including systems line-up.

Just a few of these issues are associated with the need of establishing clear policy and expectations. The cause for the prevailing part is the actual low effectiveness in compliance with these expectations in the field. To prevent repeating identification of finding of this kind in the future, it is necessary to stress the attention of the plant self-assessment process toward reviewing the application of the established plant policy during the everyday activities at all levels of the system and especially within the shift organization.

It is important to note that practically there are no similar issues identified in the topic of conduct of operations in the control room. Allocation of proper management attention to the field operation may be effectively controlled in the future.

At the same time the conduct of operations in the control room shows another significant trend of issues (8 issues for 21 missions) associated mainly with the policy level.

- *Trend: The policy for conducting main control room activities in some plants needs further strengthening (8/21).*

Several weaknesses have been observed by the review missions. These are mainly in the area of:

  – proper control over the access to the main control room (MCR), and
  – establishment of expectation for the business like conduct of the MCR activities.

Resolution of these important issues needs proper management attention on the applicability of the established good international practices as a specific part of the plan self-assessment process.

- *Trend: Some plants need improvement in implementation of a rigorous approach to control the access to and authorization of the operation of safety related equipment (6/21).*

An important trend (6 issues out of 21 missions) shows that some plants need improvements in the establishment and the implementation of proper policy to control the access and authorized actions on safety related components and equipment such as:

- proper key control system, and
- proper safety related equipment access control system.

The review of the findings shows that the complexity of the problem is not always thoroughly considered. The topic also may be brought up to the plant management attention.

The other issues identified in the chapter of "Conduct of operations" cannot show a specific trend. They are related to practices in making the operator records and practices to conduct the surveillance tests. Some other, which are actually associated with other chapters of the review (i.e. effectiveness of operators training after prolonged absence), do not lead to any trend.

The last example shows that during the IAEA missions grouping the problems is not always done in a consistent way to allow efficient review.

2.3.5. Work authorizations

Quite a few findings form the outcome of the reviews in the area of work authorizations. That is a sign that such important topics like policy establishment and procedures for work authorization control over the tests and modifications are well organized. Generally this area is performed in a way consistent with the expectations formulated in IAEA safety guidance.

Altogether eight issues (5 recommendations and 3 suggestions) are identified, which means almost one per three missions. The prevailing of them are in the implementation of the established policy, which again confirms that a good understanding about the importance of the topic should be in place. More management oversight on the application of the established policy would further reduce the number of inconsistencies identified by the international reviews.

At the same time some good practices (altogether 3 - above 25% of the findings) are identified mainly in the area of the policy. This shows that the industry is seeking for more effective ways in organizing different activities associated with work authorization, testing, systems line-up, etc.

Although the small number identified issues could form in a trend:

- *Trend: In some plants deficiencies were identified in the implementation of the equipment isolation and application of the safety measures to allow safe maintenance activities on field (5/21).*

More than 50% of the issues in the work authorization area (5 issues for 21 missions) are associated with this problem. All of them are in the implementation area, which confirms the observation about the acceptability of the established policy and the need to stress the internal self-assessment process on the implementation of those policies.

The other issues identified in the work authorization area (without showing any trends) are related to timely addressing the long lasting problems, large number of temporary modifications or effectiveness of the performed post maintenance testing.

2.3.6. Fire prevention and protection programme

The missions revealed 30 observations in the area of fire prevention and protection programme, 8 of which are good practices. The issues identified are equally distributed between the policy establishment and full implementation of tasks. The outcome is generally due to a joint effort of the whole team according to the importance of this area.

Regardless of the attention paid by the plant management to the importance of the fire prevention and protection programmes almost in all plants issues are identified in this important area (22 issues for 21 missions, out of which 16 are recommendations and 6 are suggestions).

Moreover, all identified issues are forming strong trends that should be further subject of the consideration by the plant management:

- *Trend: Some plants need to pay more attention to the material conditions of the fire protection systems and equipment and the effectiveness of the inspection programmes applicable to them (8/21).*

This is one of the significant trends within the identified issues (8 issues for 21 missions). Most of the comments are on the implementation of the developed programmes as well as on the current material conditions of the systems observed during the reviews. This shows that efforts in some plants are still needed to ensure consistent and sustainable level of preservation of the fire protection systems condition.

- *Trend: The control of the fire risk, including the storage of burnable materials and/or hazardous material remains an issue in some plants (9/21).*

That is the other important trend (9 issues for 21missions) in the area of fire protection and prevention programmes. These issues are identified through different forms on almost 1 out of 3 reviewed plants, which show that its commonality should not be neglected. Although most of the issues are associated with the implementation of the established policy, some are still at the policy level. It shows that some plants still need efforts in getting consistent approach to evaluate and control plant fire risks.

- *Trend: Important common issue is the comprehensiveness (from policy level to training support) of the fire response organization of some plants including specific areas of training, effectiveness of the organization of the different fire prevention related programmes (5/21).*

The number of the issues grouped in this trend is relatively low (5 out of 22 issues). Their nature is in the wide spectrum of the OSART team general concern, paying a lot of attention to the proven effectiveness of the plant arrangement. However, it shows a need of efforts at the policy level that should be brought to the attention of the plant management. A comprehensive self-assessment approach should address the basis for these issues on a policy level.

The good practices identified in the topic also show a trend being oriented mainly in development and implementation of different training scenarios and tools. Indirectly it shows that in this area the industry is lifting up the level of the average good practice. In the future a better approach for exchanging on these new tools may significantly increase the other plants fire response effectiveness.

2.3.7. Management of accident conditions

The topic of management of accident conditions brought up 3 findings (all of them being suggestions) from all 21 reviews conducted in the period between 2003 and 2006. No single issue was identified with regard to the assignment of the responsibilities, shift staff support or training for accident conditions. That shows the appropriateness of the attention paid by the plant management on these issues. At the same time review shows that the current process has room for improving its effectiveness.

All suggestions were related to one area:

- *Trend: The proper arrangements and preparation for accident response mainly from the point of view of management of beyond design basis accidents is not clear enough in few plants (3/21).*

Regardless the low number of the issues there is room for discussion because in this area the good international practice is still in process of creation. In the recent years the IAEA have developed and published a number of documents on the evaluation and preparation of accidents management, which are beyond the plant design basis and especially for severe accidents. However this work is not transferred yet in words in the IAEA guidance for conduct of operations.

In this area there are variety of practices, however no good practice was evaluated by the review teams. It confirms the need of systematic efforts to collect the available experience and to establish more consistent expectation level as a motivation force for the different plants activities.

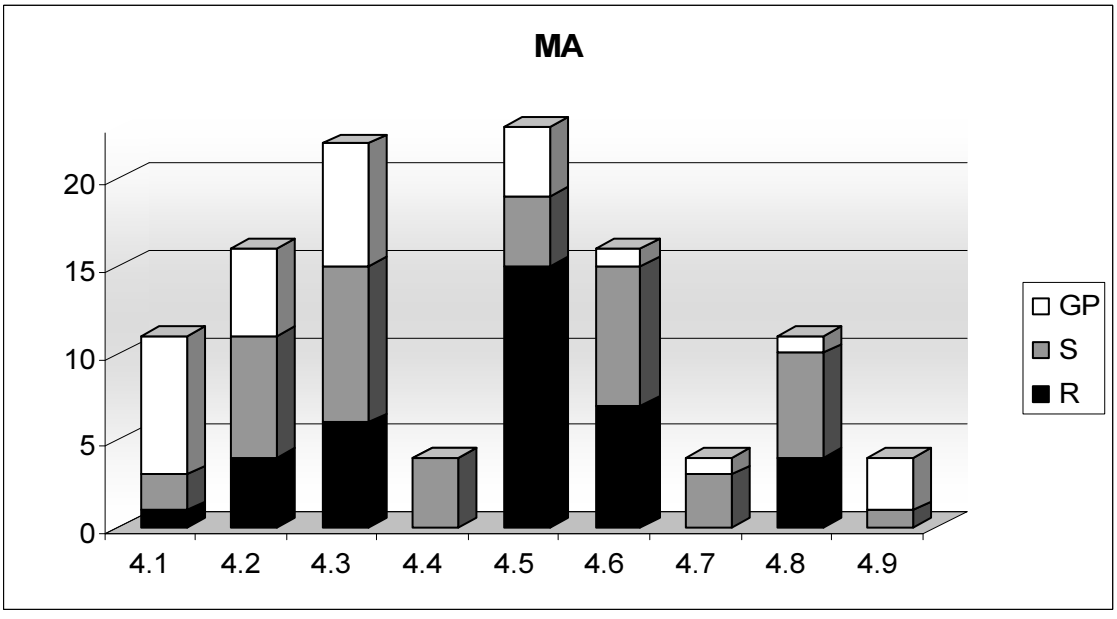
2.4. Maintenance

2.4.0 Summary results from the evaluation

The review of the maintenance area by twenty one plants resulted in 111 findings from which 37 are recommendations, 44 suggestions and 30 good practices.

The distribution of the findings between the different topics of the maintenance review is presented bellow:

Title		Rec.	Sug.	GP	Total
4.1.	Organization and functions	1	2	8	11
4.2.	Maintenance facilities and equipment	4	7	5	16
4.3.	Maintenance programmes	6	9	7	22
4.4.	Procedures, records and histories	-	4	-	4
4.5.	Conduct of maintenance work	15	4	4	23
4.6.	Material conditions	7	8	1	16
4.7.	Work control	-	3	1	4
4.8.	Spare parts and materials	4	6	1	11
4.9.	Outage management	-	1	3	4
Total		37	44	30	111



All the review missions conducted from 2003 to 2006 resulted in positive assessment on the organization of maintenance activities in the evaluated plants. No issues were identified strictly in the direction of the organization and functions of the maintenance responsible plant structures. This gives positive overall impression on the level of compliance of the plant practices with the internationally established good level of expectations.

The relatively high number of identified good practices shows that the industry is raising the safety level in that area. Based on that, it may be proposed for the future missions to further concentrate the review in this direction. It will help the plants exploring opportunities for better organization of the contractor activities, by comparison with the best current practices.

The reviews on the maintenance programmes also show that as normal practice the plants already have established maintenance programmes in compliance with the good international practices. However there is a need to improve content and solid implementation of preventive and predictive maintenance programmes.

Another area of further attention identified during the review of the maintenance facilities and equipment is the control and the calibration of the maintenance equipment and tools.

The area of "conduct of maintenance work" gathered the largest part of the findings. Their assessment shows that in this area plant management shall concentrate efforts in the application of the manifested expectations in the everyday maintenance activities. Foreign material exclusion programme and some maintenance practices in the field need improvement. High number of findings in the topic of the material conditions raised the need for more management attention in that direction.

The review on maintenance work control resulted in extremely low number of findings that shows that as prevailing practice the plants have well-established work planning and work control systems. Further improvement in this direction may be expected when new more effective practices will be identified and offered to the industry. The future international missions may seek for such examples in order to initiate another enhancement of the practices worldwide.

In the area of spare parts and materials the reviews show that generally positive assessments are made on the governing policy. However, an evident negative trend is identified in the storage and control of the spare parts and materials in the field.

The review of outage management and the outage organization revealed a level that complies with the good international practices everywhere. Good practices are identified in different outage management techniques, which is a sign that improvement shall be promoted by collection and dissemination of good practices. The future international missions may seek for such examples to accelerate the process.

2.4.1. Organization and functions

As an overall in the area of organization and functions almost one finding over two missions was identified (11 for 21 missions) being mostly good practices (8 cases out of those 11 findings). Only one recommendation and two suggestions were proposed by the review teams oriented in the implementation of the policy. No findings were added in this area during the 5 last plant reviews. Only 3 issues (1 recommendation and 2 suggestions) were raised by review teams.

- *Positive trend: Organization and functions in maintenance area are well established and applied by the plant staff.*

This gives positive overall impression on the level of compliance of the plant practices with the internationally established good level expectations. In the same time the low number of identified issues does not allow any trending which may result in meaningful conclusions for the future activities.

In opposite, the relatively high number of identified good practices shows that the industry is lifting up the understanding of the required level. Half of them are oriented toward better management of the contractors' activity which certainly shows where the plants have to concentrate their efforts to enhance the organization of the maintenance tasks.

It may be proposed that future missions focus their review also in the management of contractors. It will help the plants in exploring opportunities for better control of organization of the contractor activities, by comparison with the best practices available.

2.4.2. Maintenance facilities and equipment

The reviews of the maintenance facilities and equipment resulted in many issues (11 issues – 4 recommendations and 7 suggestions per 21 missions) and five good practices. The detailed examination of them led to question the classification of some of those to the topic of review (i.e. an industrial safety issue, storage control) leaving almost one issue in the topic per two missions.

Those results confirm the general positive assessment on the level of organization of the maintenance activities outlined in the chapter 2.4.1. of this report. It proves that plant maintenance organization pays adequate attention on the assurance of the necessary maintenance facilities and tools.

The identified issues show one trend:

- *Trend: In some plants weaknesses were identified in the control and the calibration of maintenance equipment (6/21).*

More than 50% of the issues (6 out of 11) in this topic of review are associated with the aspects of this problem. Almost all of them are related to the implementation of the control and the calibration process.

Other issues identified, (with no real possibility for trending) are related to policy using the different tools and areas, maintaining the required lighting in the shops, using wooden scaffolding in radiological controlled area.

2.4.3. Maintenance programmes

With its high number of findings (22 findings for 21 missions) the topic has the second place of importance within the maintenance section. Seven good practices were raised during the last 5 missions in 2006. The number of issues (15 of which 6 are recommendations) let this area to be of high importance. However no issues are identified in areas such as in-service inspections or corrective maintenance programmes.

At the same time the teams identified some good practices i.e. implementation of integrated maintenance programmes, risk assessment tools and performance indicators.

The identified issues show very solid trends:

- *Trend: In some plants the policy and/or implementation of plant predictive maintenance programmes were not found fully adequate (7/21).*

Almost all issues in the maintenance programmes topic (7 out of 15 issues) are associated with the management and implementation of the predictive maintenance programme. Efforts are needed at the policy level as well as in the implementation of maintenance activities.

The weight of the trend is significant considering that the issues on this matter are identified as applicable for four different plants of different regions.

- *Trend: The preventive maintenance programmes in some plants need to be improved to prevent potential equipment degradation (5/21).*

One third of issues is associated with the content and implementation of the preventive maintenance programme. The both lack of maintenance and excessive maintenance were reported. This means that efforts are needed in finding balance in preventive maintenance to exclude equipment degradation from both insufficient maintenance and unnecessary equipment dismantling.

2.4.4. Procedures, records and histories

In the area of procedures, records and histories the reviews resulted in very few findings (4 findings for 21 missions) all of them being suggestions. No good practice in that domain. The highlighted issues are mainly associated with maintenance records, and conditions of the documentation storage rooms.

- *No trends.*

These findings do not allow making any meaningful conclusions or trending of the results however lack of valuable findings in both directions rise the issue about the effectiveness to be beneficial for the nuclear industry.

2.4.5. Conduct of maintenance work

The area of "conduct of maintenance work" accumulated the largest part of the maintenance findings (23 out of 111 total). It is the area where the number of the issues is almost equal to the number of the missions (19 issues identified within 21 missions). Another important characteristic of the identified issues is that most of them are weighted on the level of recommendations (15 out of 19 issues), prevailing in the implementation of the established policy.

The distribution of the facts shows that plant management shall concentrate its efforts in the application of manifested expectations in the everyday maintenance activities results.

In addition, the issues identified shows very strong trends:

- *Trend: Implementation of an effective foreign materials exclusion programme remains an issue for some plants (10/21).*

The evaluation of the issues identified in the topic of conduct of works shows that 10 issues out of 19 are concentrated on that problem. In most of the cases the required policy is in place (except one recommendation). The actual observation shows significant room for

improvements (6 recommendations and one suggestion) in the implementation of the programme.

The issues cover the all spectrum of foreign material exclusion (FME) issues (foreign materials, use of clear plastic, orderliness, etc.). Their high number cannot exclude the commonality of the problem. It was found to be relevant for almost every other reviewed plant. This requires the issue to be highlighted within the plant self-assessment process and to be in the target for the future reviews.

It is noticeable that for their FME topic plants resolve the problem in the time between OSART and follow-up in such way that generally corrective actions raised the programme level to the level of good practices.

- *Trend: The review reveals that in some plants maintenance work practices observed show room for improvement, mainly in policy establishment and its implementation; (7/21).*

The work practices form the second important trend in the topic of the review with 7 issues associated with the problem. The identified issues are almost evenly associated with the shortcomings in the policy establishment and in its implementation.

However, in the same time there are three good practices identified also associated with the same subject. The facts show that the issue is in the focus of management but still there is a need of efforts to achieve a consistently high level in line with the well-established expectations.

2.4.6. Material conditions

This topic gathers 16 findings for 21 missions with 7 recommendations and 8 suggestions. When analyzing the findings (15 issues out of 16 findings) it is difficult to separate them from the issues identified under the topics “Maintenance programmes” and “Conduct of maintenance work”.

- *Trend: Many plants need to allocate adequate resources to achieve good material conditions (11/21).*

The strong trend identified within the findings actually corresponds with the title of the topic. In fact it is related to different aspects of the deficiencies (facts) identified in the area of material conditions.

Many findings (11 issues and one good practice out of 16 findings) are classified in the implementation (9 out of 11 issues) of maintenance work. The required policy is in place but its implementation is still not effectively done.

Further IAEA activities to avoid repeating identification include implementation of more effective approaches to communicate to the plants that in addition to the policy establishment the area requires long term efforts and communication to the field level to achieve good results.

A small part of identified issues (2 recommendations and 1 suggestion) are in the direction of the spare parts management and concerns several aspects of the process i.e. overall policy, practices of storage, spare parts control. This will be commented in this report under topic 2.4.8.

2.4.7. Work control

The purpose of the review on maintenance work control according to the OSART Guidelines is to evaluate the adequacy between work planning and work control systems. These systems ensure that work activities are properly identified, prioritized, authorized, scheduled and carried out in accordance with appropriate policies and procedures and completed in a timely manner.

The reviews conducted during the period considered concluded in an extremely low number of findings (3 suggestions and 1 good practice out of 21 missions). No trends could be identified in this area which should be brought up to the plants management attention.

- *No trends.*

The three suggestions made are mostly related to the work control policy and to the test data control. A good practice identified in this area (1 finding out of 4) shows that a plant starts using modern tools for monitoring the management and work control of maintenance tasks. Nevertheless further improvement in this direction may be expected when new more effective practices will be identified and offered to the nuclear industry. The future international missions may seek for such examples in order to initiate other enhancements of worldwide current practices.

2.4.8. Spare parts and materials

The review of maintenance in the area of spare parts and materials is concentrated on the procurement, storage and control of these to ensure that they meet the established quality or design requirements. They are available and suitable when needed.

In this area the review teams identified limited number of findings (10 issues and 1 good practice). It shows again that generally the level of the maintenance programmes of the different plant is comparable to the good international practices and the control over the spare parts and materials is part of the established policy. Nevertheless the following trend is obviously evident:

- *Trend: Some plants need to assure better arrangements in storage and control of the spare parts and materials used for maintenance works (6/21).*

Six of ten identified issues (4 recommendations and 2 suggestions) are mainly oriented in the direction of the spare parts management and concerns several aspects of the process i.e. overall policy, practices of storage, spare parts control. The repeating character of the finding calls for further plant management attention in this direction as part of the internal self-assessment process.

Another important input to that problem is the issues classified by the OSART missions within the review chapter 2.4.6. “Material conditions”. The issues associated with that problem formed the other trend, identified in that topic of review (3 out of 15 issues in that topic). It is important to mention that all of them (2 recommendations and one suggestion) are related to the policy establishment, which shows that in this direction still the plants’ management needs to allocate more attention.

The other issues are related to risk materials storage (2 out of 10 issues) and regardless of their small number it may be suggested to be a part of that attention.

2.4.9. Outage management

Main items of the review of outage management are the outage organization and control, outage planning and scheduling. The review of these processes revealed that they are organized and conducted in a level that complies with the good international practices everywhere.

- *No trends.*

Four findings were recorded (1 suggestion and 3 good practices) during the all 21 missions. The suggestion in fact is more oriented to the area of training than actually to the items under review in outage management.

All the three good practices are in the area of different outage management techniques. This is a good sign that, in this direction, current practices should be promoted by collecting and dissemination of good practices. The future international missions may seek for such examples accelerate quality of outage processes.

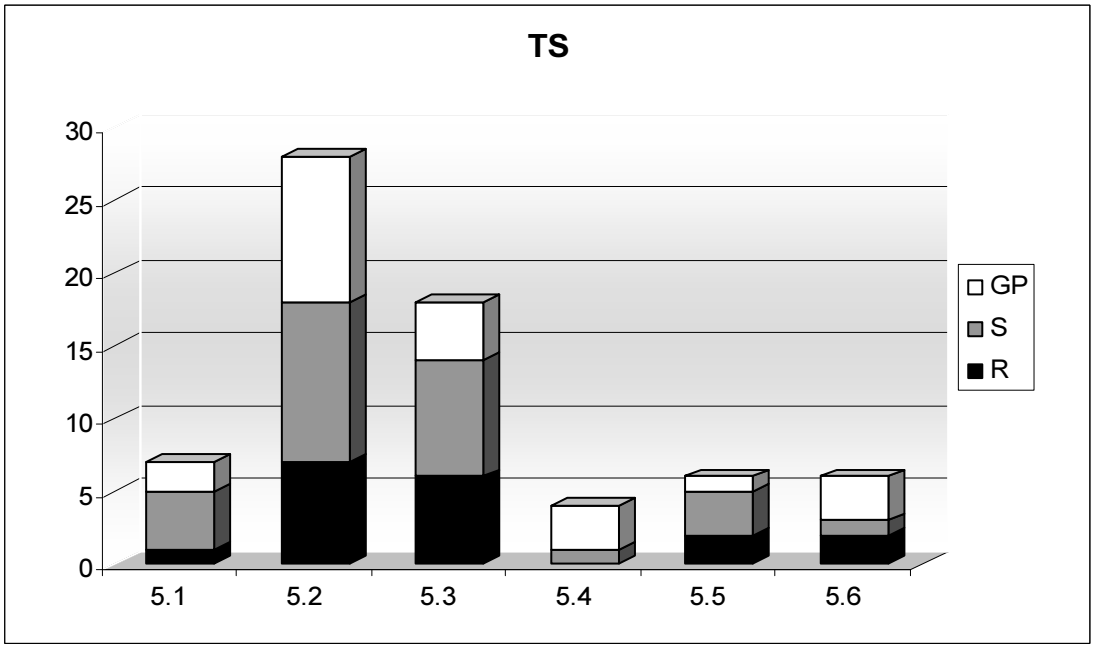
2.5. Technical support

2.5.0 Summary results from the evaluation

The review of the area by the 21 NPPs resulted in 69 findings from which there are 18 recommendations, 28 suggestions and 23 good practices.

The distribution of the findings between the different topics of the Technical Support (TS) review is presented below:

Title		Rec.	Sug.	GP	Total
5.1	Organization and functions	1	4	2	7
5.2	Surveillance programme	7	11	10	28
5.3	Plant modification system	6	8	4	18
5.4	Reactor core management (reactor engineering)	0	1	3	4
5.5	Handling of fuel and core component	2	3	1	6
5.6	Computer based systems important to safety	2	1	3	6
Total		18	28	23	69



In addition there are one recommendation and one suggestion in the commissioning area which dealt with TS area.

The following evaluation summarizes the outcome of the trends and tendencies identified from the findings.

As a result, 8 trends including 1 major, 3 medium and 3 less significant were identified. Further, two recommendations directly addressed to the IAEA were also identified summarized into one trend.

The IAEA may also consider developing some standards or guidance documents for reviewing decision making using PSA, long term operation and ageing management.

2.5.1. Organization and functions

In the area of organization and functions during the mentioned period, 7 findings were identified. Majority of them were issues including 1 recommendation and 4 suggestions. Topics were diverse such as monitoring/review of safety related activities, quick resolution of problems, usage of tools for risk informed decision making, interaction of safety and non-safety equipment, and ageing management.

- *Trend: In few plants (3 issues out of 21 plants), the Probabilistic Safety Assessment (PSA) of the plant is not always used or fully developed to support decision making during operation and outage.*

For example the PSA model did not fully comply with the actual status of systems and equipment. In another case, the plant used the PSA to reduce the level of risk arising from on-line maintenance planning, by calculating risk rate Core Damage Frequency (CDF) as well as the weekly cumulative risk, which was identified as a good practice. However, the plant did not have a PSA to assess the risk in the shutdown modes of operation.

Among identified topics, the interest to the risk informed decision making and the ageing management have been increasing.

The IAEA might consider developing some standard or guidance documents for reviewing decision making using PSA and ageing management (2/21).

Following are relating issues on ageing management. The methodology and criteria for preparation of a list of systems, structures and components (SSCs), which should be part of the ageing management programme and parameters and structure for practical process of scoping of SSC are not always clearly established.

2.5.2. Surveillance programme

In the area of surveillance programme during these periods, 28 findings were identified. 10 of them are good practices and 18 were issues including 7 recommendations and 11 suggestions.

The number of findings was the top among the technical support area.

- *Trend: In many plants, systematic, integrated and independent monitoring and assessments/reviews including trend analysis of safety related system conditions from surveillance results are not fully developed in order to detect any possible degradation of the safety systems performance in its early phase (14/21).*

In order to evaluate and mitigate potential equipment degradation, comprehensive monitoring and assessments/reviews of safety related system conditions are important. In some cases, different organizations collect and assess various types of data used to survey the safety systems status, but integrated assessment of safety system status was not performed. Also trend analysis for the surveillance test results was not fully and systematically conducted.

- *Trend: In few plants, procedures used for surveillance tests did not contain sufficient information (3/21).*

In few cases, the actions to be taken if deviations were observed during the test and/or the safety significance of the test were not described in the procedure.

2.5.3. Plant modification system

In the area of plant modification system during this period, 18 findings are identified. 4 of them are good practices and 14 are issues including 6 recommendations and 8 suggestions.

The number of findings is the second among the technical support area.

- *Trend: In some plants, the temporary modification programme is not comprehensive regarding identification, impact analysis, limited initiation, marking and timely termination (7/21).*

In some cases, temporary modifications remain in the field for long periods without regular review. Some temporary modifications were conducted without proper authorization and/or safety impact analysis.

- *Trend: In some plants, the OSART identified that planning, categorization and review of permanent modifications were not complete (6/21).*

There were some cases where coverage of planned modifications was limited around the modified area but in fact it made impacts on other equipment.

On the contrary, the OSART identified some good practices on modification control. These good practices include integration of the information of modification status and minimization of the impact of modification.

2.5.4. Reactor core management (Reactor engineering)

During four years (2003-2006), only 1 issue on reactor engineering was identified. 3 good practices completed the review results. The lack of root cause investigation for leaking fuel was the only negative aspect under this chapter.

To pursue continuous improvement in this area, the IAEA could focus on upgrading the review contents in this area at the timing of next review of OSART Guidelines e.g. by inciting the reviewer to collect more good practices.

2.5.5. Handling of fuel and core components

In the area of fuel handling during this period, 6 findings were identified. 1 of them is a good practice and 5 were issues including 2 recommendations and 3 suggestions.

- *Trend: In some cases (5 out of 21 plants), quality assurance activities such as delegation of authority, qualification, inspection, and implementation of fuel handling activities was not fully implemented***.**

2.5.6. Computer based systems important to safety

In the area of computer applications important to safety during this period, 6 findings were identified. Three (3) of them are good practices and 3 were issues including 2 recommendations and 1 suggestion.

- *Trend: Although there were no issues identified on process computer, in few cases (3 out of 21 plants) the use of computer application, which was categorized as low safety significance or was acquired externally, was not validated and/or reviewed.*

For example, there were no guidelines or standards regulating analysis performed with externally acquired computer application.

In this area, some good practices were identified on the system, which transmit the current plant data to the office for wide use to minimize the burden of information requests on the control room staff.

2.6. Operational experience feedback

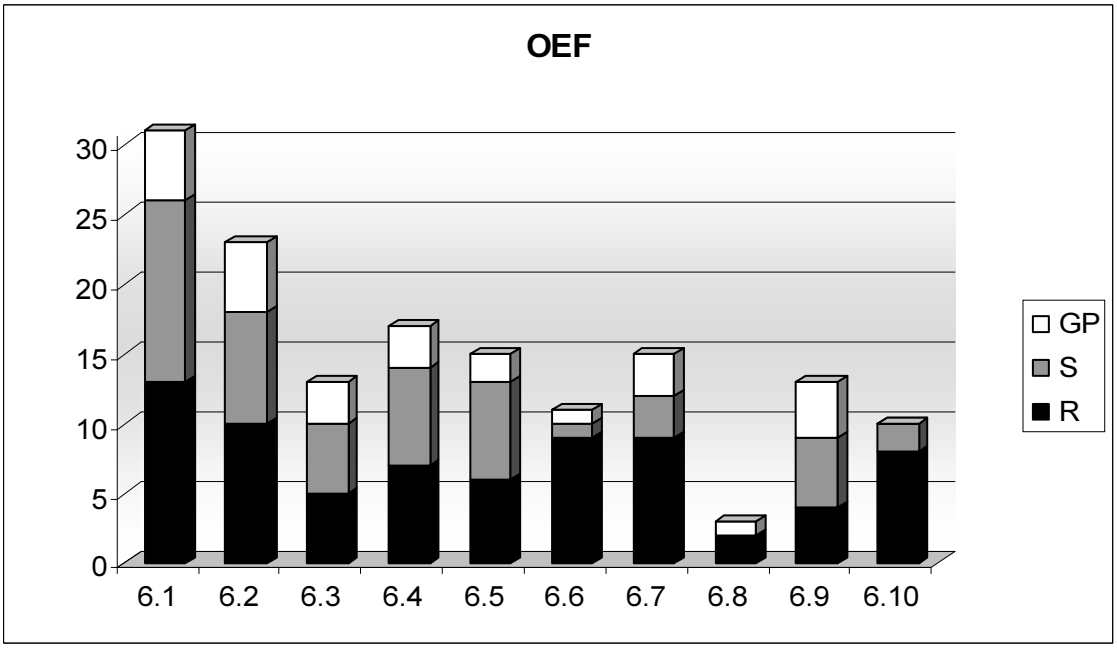
2.6.0 Summary of results from the evaluation

Operational experience feedback (OEF) includes in-house and mostly also external operating events. Some NPPs have already OEF programme also for low-level events and near misses for all type of deviations: failures, malfunctions and deficiencies. Such approach is important for the improvement of safety and work efficiency, and results are visible even if the whole programme is not fully implemented.

For significant events usually root cause analysis is provided including graphics. Trending of low level and near misses events shows inadequate work practices, some flexibilities in applying closely procedures, inattention to detail and component ageing. Analysis of such trends helps to identify precursors of declining performance and prompt implementation of corrective actions. Performance indicators (IAEA, WANO) are usually, but still not always, used. Corrective actions are implemented in case of inappropriate value or trend. However, there are still deficiencies in OEF in some of NPPs.

Issues and trends in operational experience feedback (OEF) system:

Title		Rec.	Sug.	GP	Total
6.1	Strategy and organization	13	13	5	31
6.2	Event deviation reporting and tracking	10	8	5	23
6.3	Screening of report for significance	5	5	3	13
6.4	Investigation and analyse process	7	7	3	17
6.5	Trend and trending review	6	7	2	15
6.6	External operating review	9	1	1	11
6.7	Action management programme	9	3	3	15
6.8	Immediate review of events with significant plant impact	2	-	1	3
6.9	Utilization and dissemination of operating experience information	4	5	4	13
6.10	Programme results and monitoring of effectiveness	8	2	-	10
Total		73	51	27	151



The table above shows operational experience feedback (OEF) performance resulting from the 21 OSART missions conducted in the period 2003–2006 and the 4 PROSPER missions (2000 – 2006). The arrangement of the chapters follows the PROSPER mission guideline, which is close to the succession of chapters in the OSART guideline.

The major trends in this area could be grouped into two different topics:

- In many plants, low-level events and near misses are not sufficiently reported, not handled systematically or even not considered in the OE process.

- In many plants, there is no clear integrated oversight process, nor a consistent understanding at individual level of the overall ownership of the OE process. Moreover, there is insufficient awareness of the implications of each individual contribution to the overall OE process.

The key observations in different operational areas that may characterize the status of operational safety in nuclear industry are presented in the following sections.

2.6.1. Strategy and organization

Many issues on low level events (LLE) and near misses (NM) in different sub-chapter of Operating Experience Feedback System were raised by the OSART teams. As a whole, they were identified as strong trend and integrated in this sub-chapter.

- *Trend: In many plants, low-level events and near misses were not sufficiently reported, not handled systematically or even not considered in the OE process. Therefore, LLE and NM were not utilized to identify weaknesses, error likely situations and early warnings of potential declining performance (17/25).*

As examples to enhance the reporting, use of user-friendly procedure or tools and clear communication of management expectation were suggested.

The IAEA may consider collecting and disseminating good practices collected on reporting low level events and near misses.

Many issues on integrated oversight and individual's awareness of OE were identified. As a whole they were identified as strong trend and integrated in this sub-chapter as follows.

- *Trend: In many plants, there is no clear integrated oversight process, nor a consistent understanding at individual level of the overall ownership of the OE process. Moreover, there is insufficient awareness of the implications of each individual contribution to the overall OE process.*

The IAEA may consider collecting and disseminating the good practices to increase the individual awareness of OE process.

Following weak trends were also identified in a few cases.

- *Trend: Operational organization should document the OE process strategy (policy) and manager's expectations, establishing in a very clear manner the main challenging goals, objectives, roles and responsibilities of all personnel involved in the OE process. Standardized and integrated sub-processes within the global process structure should be developed. (3/25).*

Lack of basic uniformity can lead to missed opportunities in identifying lessons to be learned from processes such as low level event identification programmes.

2.6.2. Event/deviation reporting and tracking

In this sub-chapter, many issues were identified on reporting the low level events and near misses. These issues were integrated in the trend of 2.6.1.

- *No trend.*

2.6.3. Screening of report for significance

Following weak practices were identified:

- Event classification was not established in line with good international practices for application against all reported (identified) events in order to assess their significance.

- A formal screening process was not held routinely to review all defect/event report forms to assess their significance, to assign actions and produce management reports on these defect/events, according to their significance.

- A set of indicators and challenging objectives were not established and monitored in some plants to assist the achievement of reducing time between occurrence of an event and the commencement of further analysis.

- *Trend: In some cases, an event classification system, a formal screening process, a sets of indicators and challenging objectives were not always established to assess the significance of the events, to assign actions and produce management reports on these defect/events.*

2.6.4. Investigation/analysis process

Following weak trends were identified:

- *Trend: In some plants timeliness of event investigation and analysis process was not proper and the evaluation criteria for performance indicators was not enough to make them more challenging and better reflect the real situation in this area.*

- *Trend: In a few plants, the quality of the root-cause analysis performed at the different levels was not sufficient.*

The application of enhanced methodologies and dedicated event analysis techniques such as root-cause analysis, change analysis and barrier analysis, etc. should be considered.

2.6.5. Trend and trending review

The following weak trends were identified.

- *Trend: In some plants a coding system for trending review and analysis of all reported (identified by plant staff) events/defects, regardless of their significance was not established.*

The established trend codes should be assigned to each reported event in timely manner.

- *Trend: In a few plant all necessary information on events/defects was not provided by an OE process owner department.*

This assists in ensuring that any departments that wishes to carry out trend analysis receives coherent information. Standard should be established across the plant, which is built on real logical bases. Departments that carry out their own trending analysis (based on plant unique coding system) should use this information within the OE process. Plant and equipment defect, failures on a reoccurring basis, or/and to identify areas, where events regularly occur, should be clearly identified.

- *Trend: In some plants, guidance on trending did not receive comprehensive review.*

Recognizing that trends have developed in different departments of the organization, a common guidance on trending should be developed by the plant. Trends derived from these different sources should be presented together with trends, giving a total picture of the plant in order to facilitate the easy capture of developing or recurrent problems.

- *Trend: The threshold for significance of events, which are used for trending human performance to better identify reoccurring, generic and/or emergent issues, is not sufficiently developed in a few plants.*

2.6.6. External operating review

The following weak trends were identified.

- *Trend: In some plants, a guideline for performing external OE evaluation is not developed.*

The evaluators of external OE should also be trained in using these guidelines.

- *Trend: In some plants, insufficient consideration and utilization of external operating experience was adopted.*

External organizations should provide additional guidance to the screening process to ensure potential significant lessons learned are disseminated effectively.

2.6.7. Action management programme

The following weak trends were identified.

- *Trend: In some plants, the corrective action plan did not include all agreed actions resulted from internal and external operating experience.*

It should prioritize actions by significance and track the implementation process. The action plan should also link the actions to specific event/defect reports; other possible sources; records; responsible sections/departments for implementation of action. Due dates and tracking of the status of implementation (completed, on-going or delayed) should be included.

- *Trend: In some facilities, the number of organizations involved in the corrective action process adds uncertainty due to the interfaces between them.*

Therefore, it is necessary for an owner of the OE process to have a tool to evaluate weaknesses in the area of implementation of corrective actions that should include feedback.

- *Trend: In a few cases, an overall tracking system of prescriptive corporate corrective actions was not established at the facility level.*

This system should include tracking, accountability review and timeliness of the actions at the corporate level and feedback on the effectiveness of the actions from the plant level.

- *Trend: A few plants did not consider an in-depth investigation of the time delays in implementation of corrective actions for low-level events.*

One remedy to correct the time delays could be to set more realistic times according to priority.

- *Trend: Some plants did not establish, document and implement a process of monitoring or reviewing the effectiveness of implemented corrective actions.*

The implementation of such a monitoring or review process helps to assess how effective is the implementation of the corrective actions to prevent re-occurrence of events, occurrence of reportable or significant events or other generic plant problems.

2.6.8. Immediate review of events with significant plant impact

The following weak trend was identified.

- *Trend: The procedure for an immediate investigation and analysis of events with significant impact on plant safety was not established in a few cases.*

Thus, the investigation, analysis and proposed corrective actions should be recorded and tracked. The process should ensure, that for these events, either risk or safety assessment is properly performed, all conducted steps are recorded and the proposed and agreed corrective actions are tracked.

2.6.9. Utilization and dissemination of operational experience information

The following weak trend was identified:

- *Trend: In some plants, the utilization and dissemination process of the information resulting from the OE process was not enhanced or formalized to ensure that information is communicated in a timely and proper manner to all relevant personnel.*

Using regularly the pre-job-briefings is a convenient way to inform staff plant.

A mechanism that provides to access for the use of INPO and WANO Just-in-time folder (JITs), and the writing of plant JITs with internal events is not always user friendly.

Create and communicate the expectations of the use of JITs as an alternative to the use of Internal OE for the same purposes. Use the information exchange forums that INPO provides to get benefits from the expertise of peers from other NPPs and support the industry with plant expertise.

2.6.10. Programme results and monitoring of effectiveness

The following weak trends were identified.

- *Trend: In some plants, the self-assessment procedure is not detailed enough to ensure all items that are in the programme are assessed against the specific characteristics of the process.*
- *Trend: In some plants, performance indicators associated with Operating Experience are not always fully utilized to question anomalies in operational performance within the process.*

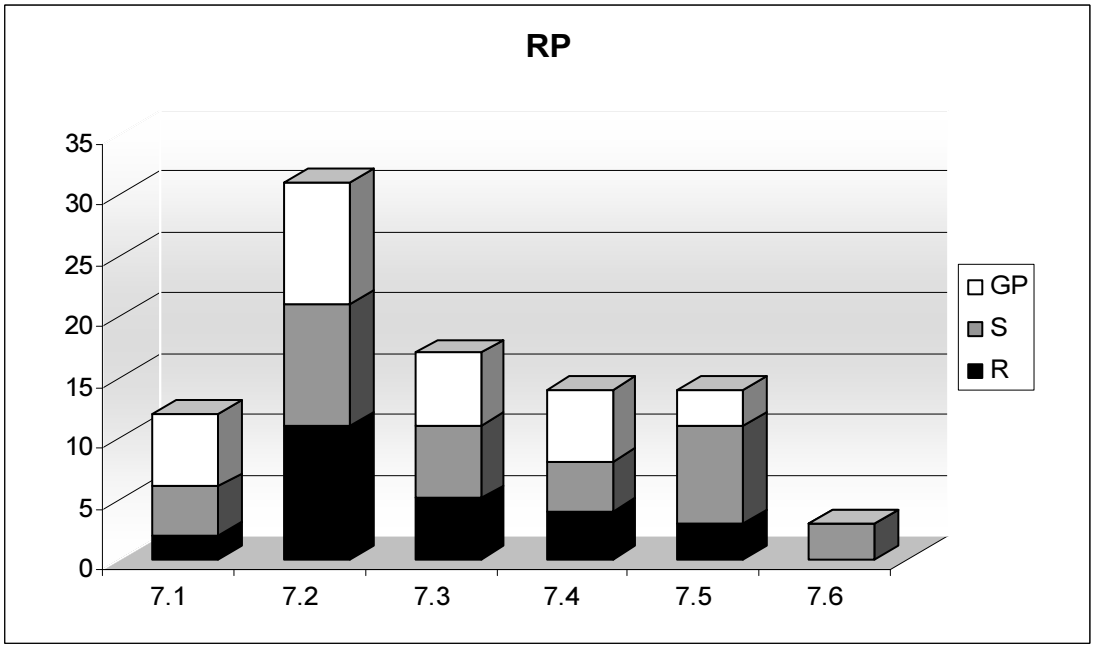
This is maybe partly due to the complex nature of the various Operating Experience activities, the non-standardization of the processes and the lack of an identified “owner” of the overall process.

2.7. Radiation protection

2.7.0 Summary results from the evaluation

In the radiation protection area, twenty one OSART missions performed during years 2003 - 2006 resulted into 91 findings, from these 25 are recommendations, 35 suggestions and 31 good practices as shown in the following table:

Title		Rec.	Sug.	GP	Total
7.1	Organization and functions	2	4	6	12
7.2	Radiation work control	11	10	10	31
7.3	Control of occupational exposure	5	6	6	17
7.4	Radiation protection instrumentation, protective clothing and facilities	4	4	6	14
7.5	Radioactive waste management and discharges	3	8	3	14
7.6	Radiation protection support during emergencies	0	3	0	3
Total		25	35	31	91



From this table, the following conclusions could be drawn as follow:

– A total number of 91 findings is relatively low for effective statistical inferences especially if then they are dispersed through several topics;

- The sub-chapter in the table, where most of the findings are grouped, is 7.2 “Radiation work control”. This sub-chapter has also the highest number and percentage of recommendations;
- Findings in topic 7.6 “Radiation protection support during emergencies” are limited to three cases (3 suggestions) and this situation is analyzed further; and
- Remaining topics are referred almost equally and are also discussed in the relevant sub-chapters.

It must be noticed, that due to some overlapping among RP subjects described in the OSART methodology, some findings are referring to more than one subject. This complexity was taken into account in endeavor to highlight trends identification.

2.7.1. Organization and functions

- *No trends.*

No major trends associated this topic. In this subject, 12 findings (6 issues, 6 good practices) were reported and issues and good practices are balanced here. These issues related to management weaknesses in use of goals and performance indicators are dominating. They are already discussed and taken into account in MOA sub-chapter 2.1.1.

Few good practices are related to good performance of medical service. Other good practices identified here could be re-classified to other subjects (mostly in sub-chapter 2.7.3) and will be discussed further.

2.7.2. Radiation work control

There are 31 findings represented by 21 issues (11 recommendations and 10 suggestions) and 10 good practices in this subject. The highest number of issues was identified in this topic. Nevertheless after deep analysis some of them could be re-classified to the subject 2.7.3. “Control of Occupational Exposure”. Number of recommendations in that sub-chapter is comparable to the sum of the recommendations from rest of RP subjects. This demonstrates some systematic deficiencies at both levels RP staff and plant staff behavior in the working attitude while working in the radiation controlled area (RCA) when compared to industry standards. A most common issue dominates:

- *Trend: Insufficient and/or inadequate and/or non effective contamination controls are recurrent in almost all plants (21/21).*

This could be defined in more details:

- Not established or weakly done access barriers,
- Weak or missing posting and/or labeling,
- Access to high radiation area not sufficiently limited,
- Personnel not performing contamination check (frisking) when leaving designated areas,
- Contamination outside RCA not checked and/or tolerated, and
- Improper/inconsistent use of protective clothes and other protective means.

In order to improve the performance, many plants have to develop more rigorous RP staff approach to reinforce management expectations for staff behavior and to enhance supervisory activity.

Most of the good practices identified are common to 2.7.2 and 2.7.3 sub-chapters. They are concentrated to dose rate planning activities and preparation of radiation work permits (RWPs), based on effective use of computer databases. Current computer technologies and accumulated volumes of data facilitate the management of radiation work control as well as the control of personnel occupational exposure.

2.7.3. Control of occupational exposure

In this topic, 11 issues (5 recommendations and 6 suggestions) and 6 good practices have been identified. Some findings from subjects 2.7.2, 2.7.4 and 2.7.5 can be also rather referenced here. Due to limited number of findings only one common trend, can be summarized.

- *Trend: At some plants, insufficient dose limitation measures are taken into account (11/21).*

This trend could be split into different items to be more complete:

- Insufficient prevention of access to hot rooms/areas (doors not locked),
- Risk evaluation practices not adequate,
- Missing dosimeters with alarming function, and
- High personnel doses tolerated.

These are items that could be identified in some plants as practices to be improved.

Improvement can be achieved through plant RP policies revision. Management could also reinforce his expectations and strive for rigorous implementation of dose limiting measures.

However, good practices were also repeatedly identified in several domains:

- Effective software support with experience feedback and complex approach for dose planning are in use, which is becoming more and more common.
- Application of dose rate reduction measures (shielding, use of remote technologies) has been also seen in many plants. While shielding can be considered as long time widely used measure, use of remotely controlled equipment (robots, cameras) reflects technology progress throughout the nuclear industry.

2.7.4. Radiation protection instrumentation, protective clothing and facilities

In this topic, eight (8) issues including equal number of recommendations and suggestions were identified.

- *In some plants, radiation protection instrumentation was found to be inadequately maintained (8/21).*

Seven out of 8 issues refer to weaknesses in instrumentation quality assurance and performance. Some plants have inadequate calibration practices, use of improper or expired

sources, or have poor sensitivity of instruments. Similar issue has been also raised in the maintenance area.

However regarding good practices, 4 out of total of 6, can be re-classified in topic 2.7.3 and are already mentioned in the previous sub-chapter of the report. 2 good practices show and demonstrate good performance in the management of radioactive sources.

2.7.5. Radioactive waste management and discharges

In this topic, 11 issues including 3 recommendations and 8 suggestions and 3 good practices were identified during the 21 OSART missions. Issues (10 out of 11) are dominantly dealing with several aspects of solid radioactive waste management, setting of limited or unchallenging goals, insufficient source minimization enforcement, inappropriate sorting limits, monitoring techniques and low reuse approach.

- *Trend: In some plants issues are very closely linked to plant waste minimization programme formulation, its implementation into relevant documentation and managerial support (10/21).*

However, two good practices are addressed almost in the same area, demonstrating positive effect of good managerial approach which balances the evident trend.

2.7.6. Radiation protection support during emergencies

Reviews in this topic resulted only into 3 suggestions and no good practice during the 21 OSART missions conducted from 2003 to 2006.

- *No trends.*

This low number is consistent with the results of previous review period (2001-2003) having no issues and only one good practice. Three issues identified are not concentrating to any specific topic and therefore cannot lead to any general conclusion. After relevant chapters in the OSART reports have been explored it could be concluded that this very low number of findings of recognized performance in vast majority of cases already corresponds to established good industry standards.

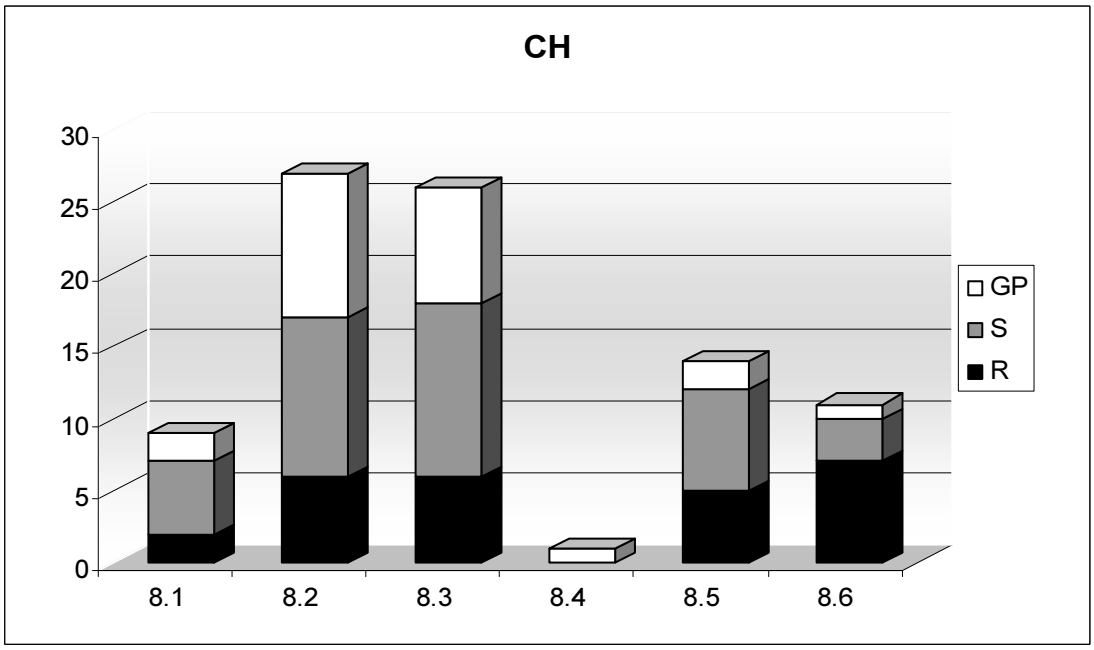
In some OSART reports, this sub-chapter is very brief and reference is made to the area "emergency planning and preparedness". Sometimes the present sub-chapter is completely missing.

2.8. Chemistry

2.8.0 Summary results from the evaluation

The twenty one OSART missions performed during years 2003 - 2006 allowed reviewing teams to provide 88 findings in the chemistry area, from those 26 were recommendations, 38 suggestions and 24 good practices. Details are shown in the following table:

Title		Rec.	Sug.	GP	Total
8.1	Organization and functions	2	5	2	9
8.2	Chemistry control in plant systems	6	11	10	27
8.3	Chemical surveillance programme	6	12	8	26
8.4	Chemistry operational history	0	0	1	1
8.5	Laboratories, equipment and instruments	5	7	2	14
8.6	Quality control of operational chemicals and other substances	7	3	1	11
Total		26	38	24	88



From this table, following conclusions could be drawn:

- The total number of 88 findings is relatively low for adequate statistical inferences and trend identifications because they are spread into 6 different sub-chapters.

- The two main topics 8.2 and 8.3 respectively gather more findings than the others and suggestions represent the majority of items. The number of good practices is also high – 10 out of 27 and 8 out of 26.

- Low number of findings in the area 8.4 is consistent with the evaluation done during the previous period 2001 - 2003 and is discussed in detail later in this chapter.

- The topic 8.6 has the highest absolute percentage of recommendations among all chemistry topics, highlighting importance of weaknesses identified and existing room for improvement in the "quality control of operational chemicals and other substances".

- Due to low number of findings in the particular topics, identification of trends is not always possible. Specific factors, like local (national, country) culture, legislation, utility policy e.g. result in some systematic deviations from OSART-criteria based line.

Classification of good practices is influenced at first by the expert and at secondly by the team. Some identified good practices do not fully correspond to OSART definition of good practice. They are routinely performed at some plants for many years already. Therefore, they may be considered rather as a good performance in already established OSART guidance.

In the area of chemistry it should be noticed that no chemistry safety standard exists yet (at the date of this report) in the IAEA reference document. The expert could find difficulties in referring to the IAEA basis to support his findings. In 2005, the IAEA started to draft a chemistry safety standard, which should be issued in 2009.

2.8.1. Organization and functions

In this subject, only a limited number of findings (7 issues including 2 recommendations and 5 suggestions, and 2 good practices) were reported.

- *No trends.*

Most of reported issues are related to communication between chemistry and other operating departments. From these issues it can be drawn that besides the current level of computerization in the data management communication effectiveness (or performance) is more influenced by the organizational and human aspects than by technical capabilities.

In current state of computerization, widely accessible, both process and chemistry plant data can be considered as important factor for fast orientation and effective response of operation.

Significant number of observations related to the handling of chemicals was reported in this topic, but they are covered by the evaluation in the MOA subject 2.1.5 "Industrial Safety Programme".

2.8.2. Chemistry control in plant systems

Chemistry control in plant systems with 27 findings is the most referred subjects (17 issues including 6 recommendations and 11 suggestions, and 10 good practices). As a frequent issue comes out:

- *Trend: In many plants, incomplete chemistry control programme were highlighted by the chemistry reviewers noticing that the most common missing controlled parameter is the analysis of organic substances. On-line monitors for some important parameters and systems are still missing and lack of systematic control for some auxiliary systems and lubricants still exist; (17/21).*

The importance of the analysis of organic substances concentration, most commonly performed as a "Total Organic Carbon" is reinforced by the several significant events from the past, where residues of decontamination solutions played significant role in development of serious safety consequences on plant equipment.

There are some indications, that plant systems are not always effectively used to achieve optimal chemistry performance.

It was sometimes recognized that technical background (explanation of chemistry parameters role and importance) in the operating documents like Water Chemistry Specification helps the plant personnel to have a better understanding of key chemistry parameter roles in assuring safe and reliable reactor operation.

The use of electrochemical technologies in water purification systems was identified as a good practice only in one case. Nevertheless this approach could be considered as good solutions for the future. This technique could have a significant impact on radwaste generation. This technique could offer better reuse of some chemicals like boric acid and lithium hydroxide, with distinguished benefit when isotopically enriched chemicals are used.

2.8.3. Chemistry surveillance programme

In the Chemical surveillance programme 26 findings (18 issues including 6 recommendations and 12 suggestions, and 8 good practices), are mainly revealing to following deficiencies:

- *Trend: Weaknesses in laboratory quality control at many plants are evident as well as miss of correct use of computer application (18/21).*

This results from:

  - Inappropriate concentration of QC standards,
  - Inadequate extent, trending and interpretation of QC charts, and
  - Inadequate calibration and benchmarking practices.

- *Trend: Weaknesses in the use of computer systems were also observed at few plants.*

Computer information systems are not always used systematically, manual handling of data among different formats and database systems allows introduction of errors, which leads to inconsistent information and may contribute to erroneous actions.

Some good practices have been also recognized in the effective use of computer systems for job planning, calibration cross checks. Some plants developed a paging system of competent chemistry personnel to inform in the case of need. These personnel are able to have wireless pager access to chemistry data.

Systematic use of solid, computer based chemistry information systems becomes now almost obligatory requirement and common practice. Proper use of such systems assures consistency and quality of data. This system allows prompt reaction of competent staff in the case of any deviation. It can provide necessary computational/trending support for evaluation of complex problems. It may serve also as a platform to preserve experience and knowledge for future generation of plant staff.

In some cases, successful participation in the different inter-laboratory tests and comparisons has been recognized as a good practice but this activity could be considered today as a

standard practice. It is already specified in the 2005 OSART Chemistry guideline expectations.

2.8.4. Chemistry operational history

In this topic, there was no issue identified through last four years. One (1) good practice could fit better into already discussed topic of Chemistry surveillance programme in the sub-chapter 2.8.3. This result is consistent with previous periods outcome 2001 - 2003.

- *No trends.*

In order to investigate possible reasons, the content of relevant chapter 2.8.4. was reviewed in particular OSART reports. In many reports, this chapter content was found to be generally short having only few sentences. In that case explanation can be as follows:

- Majority of plants already achieved standards set in OSART Chemistry guidelines. In fact, reporting system differs very much from plant to plant both in variability and content of reports but this variability does not necessarily mean weak performance.

- There is not sufficiently deep investigation in this topic during OSART missions, or standards defined are not sufficiently specific and challenging.

2.8.5. Laboratories, equipment and instruments

In the topic "Laboratories, equipment and instruments", 14 findings (12 issues, including 5 recommendations and 7 suggestions, and 2 good practices) were identified. Industrial safety issues are not discussed here as they are summarized in the section MOA 2.1.5. Taking into account some issues re-classified from 2.8.1., several grouped trends could be drawn:

- *Trend: In laboratories, labeling of samples and reagents at some plants could be improved (8/21).*

Insufficient labeling of samples and reagents is occurring despite the fact that most of plants implemented this requirement in their own procedures. Rigorous approach, which should minimize errors in produced chemistry data, is still not consistently observed. To improve performance, chemistry personnel education and supervision are the key driving factors.

- *Trend: Deficiencies in instrumentation control at some plants were noticed (4/21).*

This was due to weak or missing maintenance logbooks, improper instrument positioning and/or insufficient redundancy in operational or (on-line) laboratories' equipment.

2.8.6. Quality control of operational chemicals and other substances

In this subject, 10 issues (7 recommendations and 3 suggestions) and 1 good practice represent altogether 11 findings. There are two main areas where issues are concentrating:

- *Trend: Inadequate/insufficient labeling of chemical or hazardous substances at some plants and missing or incomplete categorization for use of chemicals in specific areas/systems (10/21).*

It should be noticed that any facts on chemicals or hazardous substances in use in the plant (in the laboratories) but also in maintenance shops or Radiation Protection premises could lead to an issue which is developed in the present sub-chapter.

- *Trend: Improper chemical storage arrangement are set up at some plants, which could be detailed as missing barriers for spillage, inconsideration of fire hazards, fall hazards and/or opened containers.*

The highest percentage of recommendations together with only one good practice indicates room for improvement in this topic.

While insufficient labeling can be considered at first as an operational risk represented by introduction of incorrect/bad quality substances into particular system, both areas can be also then considered also as a part of industrial safety deficiencies.

Categorization and appropriate labeling of chemicals for use in different plant systems and management of open containers are practices still not satisfactorily addressed in plant programmes. Practical implementation of procedural requirements is hampered by variety of departments and contractors involved in the handling and usage of many chemicals. Success in this field very much depends on effective education/training, adequate contractor accountability and adequate supervisory work. In the contractors' management, benefits may be considered from establishment of long-term contracts with companies having stabilized and trained staff. Sufficiently implemented internal rules and policies should be consistent with plant expectations.

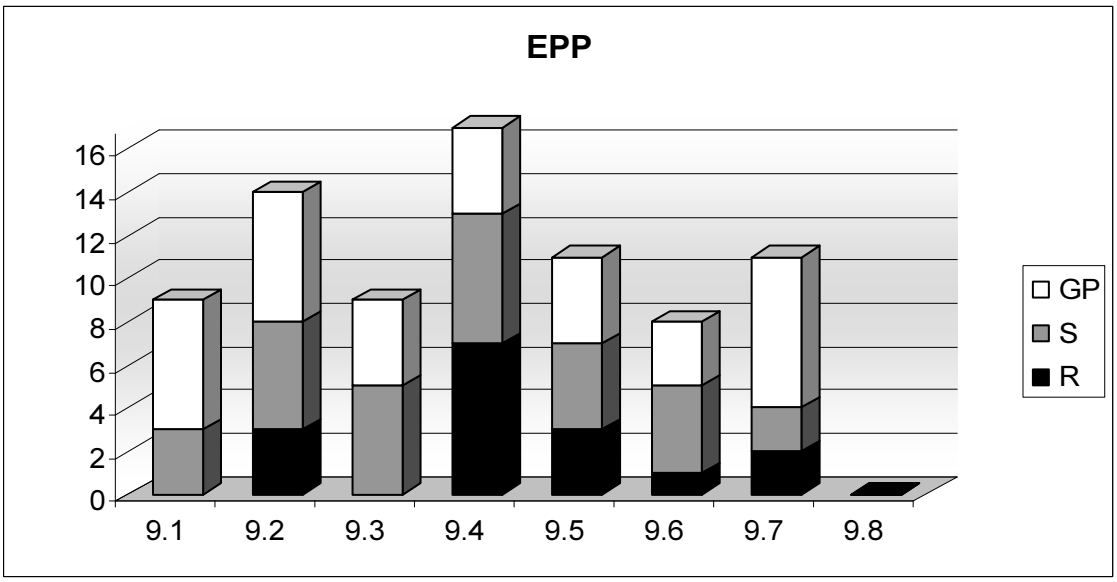
Storage of chemicals is still a problem in some plants, which frequently goes beyond the responsibility of chemistry department. Responsibility is shared also by operation, maintenance and logistic departments. Moreover, related issues could be often attributed to industrial safety, fire protection and results being achieved are dependent on the management support, adequate resources, education of personnel and extent of supervisory and self-assessment activities.

2.9. Emergency planning and preparedness

2.9.0 Summary results from the evaluation

During the period of this report, the OSART teams identified 45 issues in the emergency planning and preparedness (EPP) area. Of these 16 were recommendations and 29 suggestions. 34 good practices were identified.

Title		Rec.	Sug.	GP	Total
9.1	Emergency programme	0	3	6	9
9.2	Response functions	3	5	6	14
9.3	Emergency plans and organization	0	5	4	9
9.4	Emergency procedures	7	6	4	17
9.5	Emergency response facilities	3	4	4	11
9.6	Emergency equipment and resources	1	4	3	8
9.7	Training, drills and exercises	2	2	7	11
9.8	Quality assurance	0	0	0	0
Total		16	29	34	79



It is important to note that despite the relatively large number of good practices identified during the 21 missions, they are often of a disparate nature and do not support each other in the development of trends.

It should be noticed that for the sub-chapter 9.8 “Quality assurance” no findings were identified during 21 OSART missions.

2.9.1. Emergency programme

During the period of this report, the OSART teams identified 3 issues in this topic area – all suggestions. 6 good practices were also identified.

The relatively small amount of data makes meaningful analysis difficult; however a positive trend can be identified because in that case the number of good practices is higher than the number of issues.

- *Positive trend: There are indications (6/21) that some plants are developing good working relations with outside agencies and local communities.*

Plant management generally recognizes the importance of good working relationships with both the off-site official agencies/response units and the local communities. There is evidence of particularly strong relationships being developed in a number of plants.

2.9.2. Response functions

During the period of this report, the OSART teams identified 8 issues in this topic area, 3 recommendations and 5 suggestions. 6 good practices were also identified.

- *Trend: There are indications that emergency plans were insufficiently comprehensive to cover non-nuclear and nuclear hazards in some plants (6/21).*

Whilst all plants had emergency plans, there frequently appears to be a lack of an integrated approach that met international best practice. This was manifested in a number of ways such as plans which were not sufficiently comprehensive to cover all non-nuclear and nuclear hazards. In some plants, plans also did not draw together different emergency scenarios in a consistent manner.

2.9.3. Emergency plans and organization

During the period of this report, the OSART teams identified 5 issues in this topic area - all suggestions and 4 good practices.

- *Trend: Some plants do not appear to have procedures which effectively ensure that key activities such as evacuation management, personnel accounting and staffing of facilities can be fully adequately managed (5/21).*

All of the issues raised in this section relate to the plants ability to ensure adequate support to emergency arrangements. This is manifested by the OSART teams concerns regarding

staffing levels in monitoring/decontamination activities and, more strongly, in their concerns associated with proper management of emergency evacuation and accountancy of personnel.

Conversely, no good practices were associated with this topic and identified during the period of this report. This implies that this aspect of emergency planning is not receiving adequate management attention. This trend is also linked to one identified in the next section 2.9.4. "Emergency Procedures".

2.9.4. Emergency procedures

During the period of this report, the OSART teams identified 13 issues in this topic area, 7 recommendations and 6 suggestions. 4 good practices were also identified.

Two trends could be drawn from the results of 21 OSART missions.

- *Trend: In some plants, there is a lack of timely response to ensure that appropriate actions are taken during emergency situations (10/21).*

The majority of issues are associated with the lack of ability to determine, in a timely manner, the number of personnel on site (and more specifically, unaccounted for). It is noteworthy that the majority of the good practices in this section are associated with technological improvements to systems – none consider/improve human factors.

- *Trend: Few plants do not utilize a symptom-based approach for the mitigation of accidents into their emergency operating procedures (3/21).*

Despite being considered international best practice, not all plants incorporate a symptom-based approach for the mitigation of accidents into their emergency operating procedures.

2.9.5. Emergency response facilities

During the period of this report, the OSART teams identified 7 issues in this topic area, 3 recommendations and 4 suggestions. 4 good practices were also identified.

- *Trend: In some plants the adequacy of equipment required to ensure effective management of an emergency was insufficient (4/21).*

Details of the shortfalls vary but in general include communication and radiological assessment equipment. In some cases however there were more fundamental concerns regarding the adequacy of protection for staff in emergency centers or even in the location of the facilities themselves.

However it should also be noted that some plants had developed well-designed, well-organized facilities, which were equipped with good communication equipment.

2.9.6. Emergency equipment and resources

During the period of this report, the OSART teams identified 5 issues in this topic area, 1 recommendation and 4 suggestions. 3 good practices were also identified.

- *No trends.*

Whilst the disparate nature of the issues, they do not do support any strong trends. There are indications associated with training/behavioral considerations which support a trend in next section 2.9.7. “Training, drills and exercises”.

2.9.7. Training, drills and exercises

During the period of this report, the OSART teams identified 4 issues in this topic area, 2 recommendations and 2 suggestions. 7 good practices were also identified. This number of good practices is higher that the number of issues which has for consequence to draw a positive trend.

- *Positive trend: In some plants emergency exercises are well developed (7/21).*

All plants reviewed had established programmes for training and exercising their emergency arrangements. Some plants had developed their programmes into planned means to comprehensively test their arrangements and exercise the component parts of the support organizations both (on and off site) in challenging scenarios. In a number of cases these programmes were underpinned by significant preparatory training. Support for senior management and sophisticated communications technology are utilized to improve the efficiency of EPP plans.

However, in some cases these programmes were not sufficiently comprehensive to ensure all leaning opportunities were utilized.

2.9.8. Quality assurance

During the period of this report, the OSART teams did not identified any issues or good practices in this topic area. It is therefore not possible to identify any trends.

- *No trends.*

An inference which can be drawn from the lack of identified issues/good practices is that the plants have (in general) at least adequate quality assurance arrangements for their emergency programmes.

However, it could also imply that the OSART reviewers might not be placing sufficiently robust challenges during the missions.

2.10. OSART at the follow-up visit

OSART follow-up visits are conducted as an integral part of the OSART process, after approximately 18 months to two years after the main OSART mission. From 2003 to 2006, 22 follow-up visits were conducted.

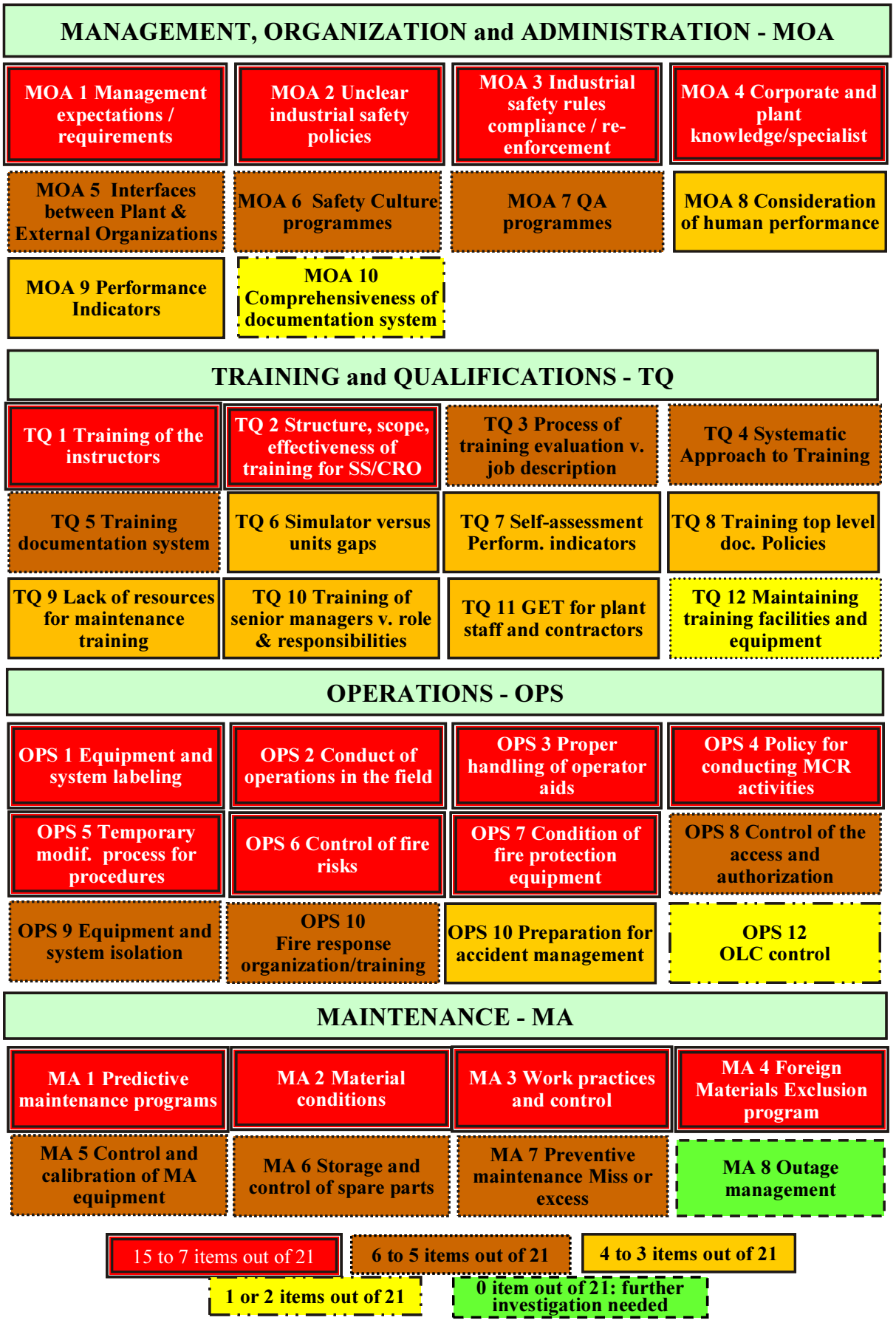
During this period, 98% of the issues (recommendations and suggestions) were either totally resolved or satisfactory progress was made. Only 2% of the issues were concluded as having an “insufficient progress”. Among 734 issues, only 2 issues were withdrawn.

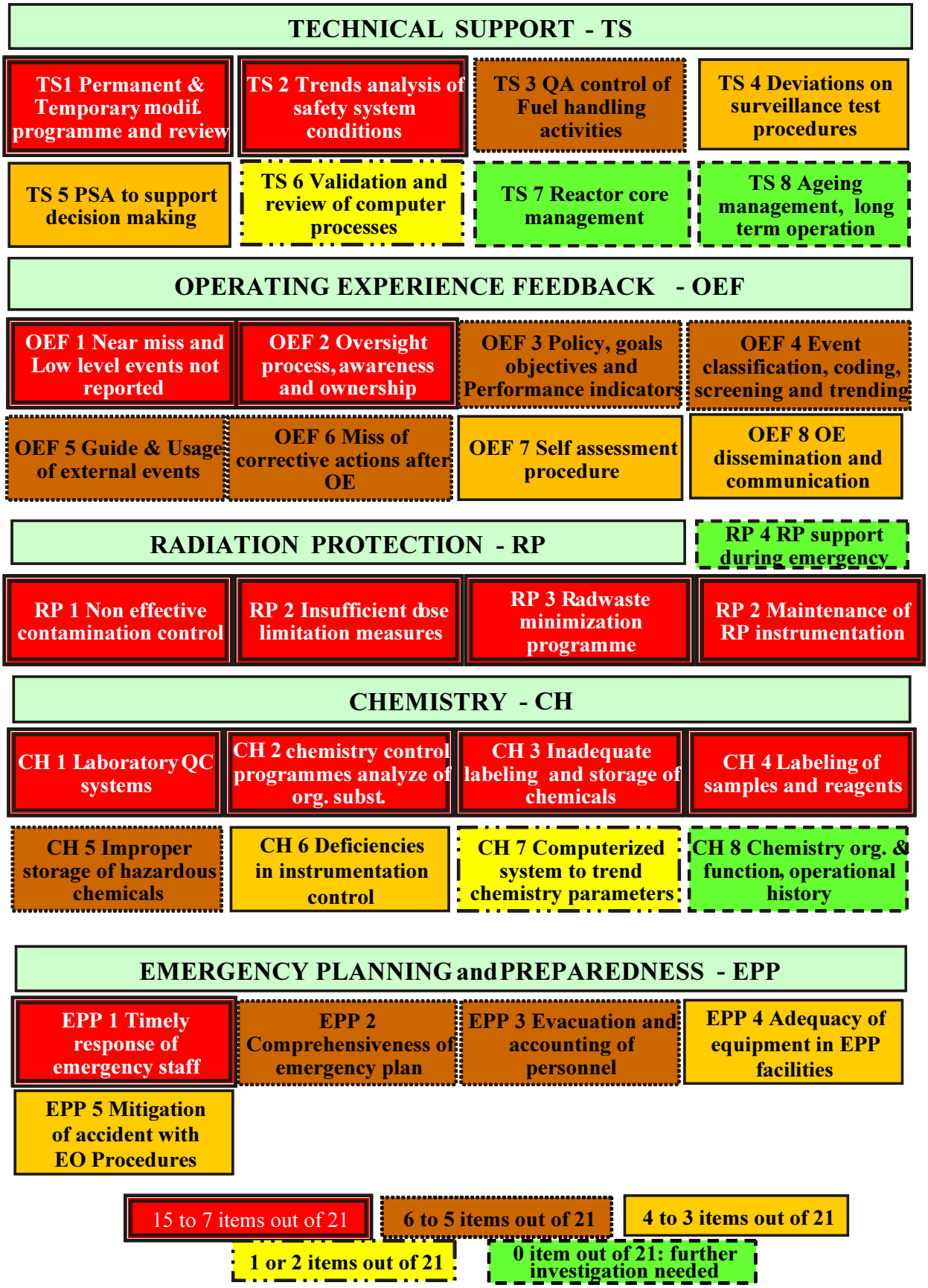
In some cases, it was notices that the corrective measures went beyond the recommendations or suggestions provided by the OSART mission and to address a more comprehensive set of issues.

These results of the follow-up visits demonstrated the effectiveness of the OSART service and the commitment of the plants to implement improvements identified by OSART teams.

APPENDIX I

OSART 2003 – 2006 Trends


MANAGEMENT, ORGANIZATION and ADMINISTRATION - MOA
MOA 1 Management expectations / requirements
MOA 2 Unclear industrial safety policies
MOA 3 Industrial safety rules compliance / re-enforcement
MOA 4 Corporate and plant knowledge/specialist
MOA 5 Interfaces between Plant & External Organizations
MOA 6 Safety Culture programmes
MOA 7 QA programmes
MOA 8 Consideration of human performance
MOA 9 Performance Indicators
MOA 10 Comprehensiveness of documentation system
TRAINING and QUALIFICATIONS - TQ
TQ 1 Training of the instructors
TQ 2 Structure, scope, effectiveness of training for SS/CRO
TQ 3 Process of training evaluation v. job description
TQ 4 Systematic Approach to Training
TQ 5 Training documentation system
TQ 6 Simulator versus units gaps
TQ 7 Self-assessment Perform. indicators
TQ 8 Training top level doc. Policies
TQ 9 Lack of resources for maintenance training
TQ 10 Training of senior managers v. role & responsibilities
TQ 11 GET for plant staff and contractors
TQ 12 Maintaining training facilities and equipment
OPERATIONS - OPS
OPS 1 Equipment and system labeling
OPS 2 Conduct of operations in the field
OPS 3 Proper handling of operator aids
OPS 4 Policy for conducting MCR activities
OPS 5 Temporary modif. process for procedures
OPS 6 Control of fire risks
OPS 7 Condition of fire protection equipment
OPS 8 Control of the access and authorization
OPS 9 Equipment and system isolation
OPS 10 Fire response organization/training
OPS 10 Preparation for accident management
OPS 12 OLC control
MAINTENANCE - MA
MA 1 Predictive maintenance programs
MA 2 Material conditions
MA 3 Work practices and control
MA 4 Foreign Materials Exclusion program
MA 5 Control and calibration of MA equipment
MA 6 Storage and control of spare parts
MA 7 Preventive maintenance Miss or excess
MA 8 Outage management
15 to 7 items out of 21
6 to 5 items out of 21
4 to 3 items out of 21
1 or 2 items out of 21
0 item out of 21: further investigation needed


TECHNICAL SUPPORT - TS
TS1 Permanent & Temporary modif. programme and review
TS 2 Trends analysis of safety system conditions
TS 3 QA control of Fuel handling activities
TS 4 Deviations on surveillance test procedures
TS 5 PSA to support decision making
TS 6 Validation and review of computer processes
TS 7 Reactor core management
TS 8 Ageing management, long term operation
OPERATING EXPERIENCE FEEDBACK - OEF
OEF 1 Near miss and Low level events not reported
OEF 2 Oversight process, awareness and ownership
OEF 3 Policy, goals objectives and Performance indicators
OEF 4 Event classification, coding, screening and trending
OEF 5 Guide & Usage of external events
OEF 6 Miss of corrective actions after OE
OEF 7 Self assessment procedure
OEF 8 OE dissemination and communication
RADIATION PROTECTION - RP
RP 4 RP support during emergency
RP 1 Non effective contamination control
RP 2 Insufficient dose limitation measures
RP 3 Radwaste minimization programme
RP 2 Maintenance of RP instrumentation
CHEMISTRY - CH
CH 1 Laboratory QC systems
CH 2 chemistry control programmes analyze of org. subst.
CH 3 Inadequate labeling and storage of chemicals
CH 4 Labeling of samples and reagents
CH 5 Improper storage of hazardous chemicals
CH 6 Deficiencies in instrumentation control
CH 7 Computerized system to trend chemistry parameters
CH 8 Chemistry org. & function, operational history
EMERGENCY PLANNING and PREPAREDNESS - EPP
EPP 1 Timely response of emergency staff
EPP 2 Comprehensiveness of emergency plan
EPP 3 Evacuation and accounting of personnel
EPP 4 Adequacy of equipment in EPP facilities
EPP 5 Mitigation of accident with EO Procedures
15 to 7 items out of 21
6 to 5 items out of 21
4 to 3 items out of 21
1 or 2 items out of 21
0 item out of 21: further investigation needed

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